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Dictionary of metallurgical and chemical



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# Dictionary

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## METALLURGICAL and CHEMICAL MATERIAL

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1910

PUBLISHED BY

***Metallurgical  
and Chemical  
Engineering***

239 West 39th Street, New York



# DICTIONARY

OF

## Metallurgical and Chemical Machinery, Appliances and Material

MANUFACTURED OR SOLD BY ADVERTISERS IN

***Metallurgical  
and Chemical  
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*SECOND EDITION*

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PUBLISHED BY  
METALLURGICAL AND CHEMICAL ENGINEERING  
239 West 39th Street, New York City

This arrangement has been generally made use of in the Dictionary, as under pyrometers in Part II, where this principle of arrangement enables a clean division into a number of prominent general types with distinct special features and limitations of temperature.

The descriptive notes have either been furnished by the advertisers themselves, especially for this purpose, or have been compiled from the trade literature or advertisements of the various firms.

One copy of this Dictionary we are sending, free of charge, to every subscriber and advertiser.

Our thanks are due to many friends for corrections and suggestions, all of which have found due consideration in this second edition. For the future we ask again for the coöperation, by criticism or suggestion, of all who will use this little book in the task, often so troublesome, of looking for information "where to get things."

METALLURGICAL AND CHEMICAL ENGINEERING.  
New York, June, 1910.



# PART I.

## Machinery, Appliances, and Material for Chemical and Metallurgical Industries.

(For Measuring Instruments and Laboratory Supplies, see Part II.)

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**ABBÉ** Tube Mill and Ball Mill. See Crushing and Grinding.

**ABRASIVES.** See Carborundum, also Coruhin.

**ABSORPTION TOWERS.** System Kypke and Lunge-Rohrmann, complete or in single parts made of acid-proof stoneware for absorption purposes.

—**DIDIER-MARCH COMPANY**, NEW YORK.

(Other stoneware makers see Stoneware.)

**ACCUMULATORS, HYDRAULIC.**

—**MACKINTOSH, HEMPHILL & CO.**, PITTSBURGH, PA.

**ACETATE OF LEAD.** Sugar of lead. All grades.

—**THE GRASSELLI CHEMICAL CO.**, CLEVELAND, OHIO, CHICAGO, ILL., AND NEW YORK.

**ACETYLENE CYLINDERS.** For storing acetylene, and acetylene generators for welding. See Welding, Oxy-Acetylene.

—**AMERICAN OXYGEN CO.**, PHILADELPHIA, PA.

**ACETYLENE GAS** is made from calcium carbide and water. Calcium carbide produced and sold by

—**UNION CARBIDE CO.**, CHICAGO AND NEW YORK.

**ACETYLENE GENERATOR.** Insures a constant supply of acetylene gas at an equal maximum pressure of two pounds for welding purposes. See Welding, Oxy-Acetylene.

—**INDUSTRIAL OXYGEN CO.**, NEW YORK.

**ACETYLENE PRESSURE GENERATOR.** Used with the Davis-Bournonville oxy-acetylene process of welding and cutting, will maintain a pressure of 15 lbs. per sq. in., enabling users of the process to pipe the acetylene gas to various points in the factory where the process can be carried on most conveniently.

—**DAVIS-BOURNONVILLE CO.**, NEW YORK.

**ACHESON GRAPHITE.** See Graphite.

**ACIDS.** Chemically pure. Hydrochloric, nitric, sulphuric acids. Full particulars and prices on request.

—THE BAKER & ADAMSON CHEMICAL CO., EASTON, PA.

**ACIDS.** Sulphuric, fuming sulphuric, muriatic, nitric, mixed, acetic, hydrofluoric, hydrofluosilicic, battery and phosphoric acids and battery solutions.

—GENERAL CHEMICAL CO., NEW YORK CITY.

**ACIDS.** Sulphuric, muriatic, nitric, hydrofluoric and mixed acids.

—GENERAL CHEMICAL CO. OF PENNA., PITTSBURGH, PA.

**ACIDS.** Chemically pure. Hydrochloric, nitric, sulphuric acids. Full particulars on request.

—GENERAL CHEMICAL CO. OF PENNA., PITTSBURGH, PA.

**ACIDS.** "Baker's Analyzed Chemicals." Every label shows an analysis, and our guarantee provides that the contents of each bottle will conform with that analysis.

—J. T. BAKER CHEMICAL CO., PHILLIPSBURG, N. J.

**ACIDS.** Sulphuric, distilled for storage batteries.

—GENERAL CHEMICAL CO. OF PENNA., PITTSBURGH, PA.

**ACIDS.** Sulphuric, muriatic and nitric. Mixed acid for nitro-glycerine trade. Acetic acid—all strengths. Storage battery acid. Aqua fortis. Heavy chemicals for all purposes.

—THE GRASSELLI CHEMICAL CO., CLEVELAND, OHIO, CHICAGO, ILL. AND NEW YORK.

**ACIDS.** Chemically pure. Sulphuric, hydrochloric, nitric and aqua ammonia. For manufacturing and laboratory purposes. Full information on request.

—THE GRASSELLI CHEMICAL CO., CLEVELAND, OHIO, CHICAGO, ILL. AND NEW YORK.

**ACIDS.** Sulphuric, oil of vitriol, muriatic, nitric. Mixed acids for high explosives.

—PENNSYLVANIA SALT MFG. CO., PHILADELPHIA, PA.

**ACIDS.** Commercial sulphuric, nitric and muriatic, liquid carbonic, electrolyte (battery fluid).

—THE WESTERN CHEMICAL MFG. CO., DENVER, COLO.

**ACID ELEVATORS.** Montejus, made of acid-proof stoneware in all sizes. These montejeus are tested to resist various pressures depending on the size of vessel. Used to elevate acid by means of compressed air.

—DIDIER-MARCH CO., NEW YORK.

(Other stoneware makers see Stoneware.)

**ACID PROOF.** Materials. See Brick, Kettles, Pipe, Tanks and Vitreosil acid-proof, chemical apparatus.

**ACID PUMPS.** See Pumps, Acid.

**ACID RETORTS** of fused silica.

—THE THERMAL SYNDICATE LTD., NEW YORK.

(See also Quartz, Fused in Part II of this Dictionary.)

**ACID RETORTS,** Pans, Lifts, and Stills. See Castings, Chemical. Also Stoneware.

**ACID SYPHONS.** See syphons acid.

**ACID TUBING.** Rubber.

—REVERE RUBBER CO., BOSTON, MASS.

—BOSTON BELTING CO., BOSTON, MASS.

**ACID TUBING.** Fused silica.

—THE THERMAL SYNDICATE LTD., NEW YORK.

(See also Quartz, Fused, in Part II of this Dictionary.)

**" ADVANCE " WIRE.** See Wire.

**AGITATORS.** See also Blowers.

**AGITATORS—STEAM-JET.** The Koerting agitators offer a means of rapidly and immediately mixing or dissolving chemicals in water or other liquids. This process is generally carried on with mechanical stirrers which frequently fail to give the desired effect. The Koerting agitator is extremely simple in construction, easy to fix and work, and costs very little and obviates all disadvantages of the mechanical stirrers. The action is based upon the fact that a steam-jet issuing from a small nozzle into a larger one carries along with it the surrounding air and gives this air a velocity sufficient to overcome a pressure of fully 8 feet of water. The air escaping with great force from holes in pipe fixed at bottom of tank causes a violent agitation of the liquid surrounding it and stirs up and drives in all directions any solid matter. This agitator has no moving parts, is easily installed and occupies small space, requires no attention, and is economic in consumption of steam.

—SCHUTTE & KOERTING CO., PHILADELPHIA, PA.

**AGITATORS AND ELEVATORS OF STONEWARE.** For lifting and stirring acids, can be worked either by steam or compressed air; very simple and efficient apparatus.

—J. W. SITTIG, NEW YORK.

(Other Stoneware makers see Stoneware.)

**AIR COMPRESSORS.** See also Blowers.

**AIR-COMPRESSORS.** Steam-driven, belt-driven, electrically-driven, hydraulic driven.

—ALLIS-CHALMERS CO., MILWAUKEE, WIS.

**AIR JET-LIFT.**

—BETHLEHEM FOUNDRY & MACHINE CO., SOUTH BETHLEHEM, PA.

**AIR-JET LIFT.** The Koerting Air-jet Lift is made of almost any material desired, iron, brass, lead, stoneware, hard rubber, etc., and is operated by compressed air. It works without mechanism; and can be installed (for instance) in drilled or artesian wells. This lift, like all air-jet lifts must be installed as deep under the level of, the liquid as corresponds to height of lift. It has three connections; suction at bottom (to which a strainer may be attached if desired) air inlet and discharge connections directly on top. This air-jet lift is to be recommended very highly where dilution of acids by steam is objectionable; also on account of its greater efficiency over steam-jets or piston pump, due to no loss in condensation of steam through long pipes, and as a piston pump cannot always be made of suitable material. Catalog HH-2.

—SCHUTTE & KOERTING CO., PHILADELPHIA, PA.

**AIR SEPARATION.** For grinding mills. See Crushing and Grinding, Raymond Mill, and Stroud Mill. See also Separator, Blast, and Separator, Vacuum.

**ALLOYS.** See also ferro-alloys and other alloys.

**ALLOYS.**

—AMERICAN VANADIUM CO., PITTSBURGH, PA.

—ATKINS, KROLL & CO., SAN FRANCISCO, CAL.

—BLACKWELL, SONS & CO., GEO. G., LIVERPOOL, ENGLAND.

—ELECTRIC SMELTING & ALUMINUM CO., LOCKPORT, N. Y.

—FUERST BROS. & CO., NEW YORK.

—GOLDSCHMIDT THERMIT CO., NEW YORK.

—LAVINO & CO., E. J., PHILADELPHIA, PA.

—LEAVITT & CO., C. W., NEW YORK.

—PRIMOS CHEMICAL CO., PRIMOS, PA.

—ROESSLER & HASSLACHER CHEMICAL CO., NEW YORK.

**ALLOYS.** "S. A. M. alloy" for producing sound ingots and castings free from blowholes. We also make a special high-speed alloy for tool steel.

—GEO. G. BLACKWELL, SONS & CO., LTD., LIVERPOOL, ENGLAND.

**ALUM.** Lump, burnt, ground and filter alums.

—GENERAL CHEMICAL CO., NEW YORK CITY.

**ALUM.** Alum and Sulphate of Alumina for filtering purposes.

—GENERAL CHEMICAL CO. OF PENNA., PITTSBURGH, PA.

**ALUM.** Crystal or lump alum. All forms of alum for filtering purposes.

—PENNSYLVANIA SALT MFG. CO., PHILADELPHIA, PA.

**ALUMINA.** Sulphate and chloride of alumina.

—GENERAL CHEMICAL CO., NEW YORK CITY.

**ALUMINA.**

—PENNSYLVANIA SALT MFG. CO., PHILADELPHIA, PA.

**ALUMINIUM.** Of first quality, guaranteed over 99% pure. Ingots, sheets, rods and wire.

—ELECTRIC SMELTING & ALUMINUM CO., LOCKPORT, N. Y.

**ALUMINIUM.** Ingots, rods, granulated, for use in steel industry.

—JANNEY, STEINMETZ & CO., PHILADELPHIA, PA.

**ALUMINIUM.** For use as deoxidizing agent in iron and steel industry. Light alloy castings. Aluminium wire, etc.

—C. W. LEAVITT & CO., NEW YORK.

**ALUMINIUM, NO. 15 ALUMINIUM ALLOY.** Contains 82% aluminium. Specific gravity 3.00. A good casting alloy suitable for pattern work, etc.

—ELECTRIC SMELTING & ALUMINUM CO., LOCKPORT, N. Y.

**ALUMINIUM BRONZE.** All the different grades of aluminium bronze in ingots.

—ELECTRIC SMELTING & ALUMINUM CO., LOCKPORT, N. Y.

**ALUMINIUM NICKEL.** One of the strongest light aluminium casting alloys. Contains 93% aluminium, the hardening ingredients being nickel and copper. Specific gravity 2.75. Suitable for automobile castings and other work requiring a light alloy of maximum strength.

—ELECTRIC SMELTING & ALUMINUM CO., LOCKPORT, N. Y.

**ALUMINIUM IN STEEL.** Aluminium is largely used in the manufacture of steel; the amount varying as to the grade of the steel, the amount of occluded gases, the temperature of the molten metal, etc. The amount varying from  $\frac{1}{8}$  to  $\frac{3}{4}$  of a pound per ton of steel. The advantages of aluminium in steel manufacture are as follows:—

(1) Producing ingots with solid tops, thereby greatly decreasing the scrap; (2) Quieting of boiling in molten steel, thereby proving a much needed aid in the handling and control of wild heats; (3) As an aid to homogeneity in steel:—(a) By preventing oxidation. (b) By a property of rapidly permeating the molten mass, thereby greatly aiding other alloys to combine homogeneously with the steel; this is especially true of nickel. (c) By causing steel to solidify more evenly, thereby avoiding segregation of phosphorus and other impurities; (4) Increasing tensile strength without a decrease of

ductility; (5) Removal of any oxygen or oxide from the steel (good steel for electrical purposes has been produced using aluminium exclusively to remove the oxidation, thereby giving in the finished product a very low manganese content); (6) Rendering of the steel less liable to oxidation (by stopping boiling in the moulds, thus preventing a continuous exposure of fresh surfaces of molten steel to the atmosphere); (7) Producing ingots and castings of smooth surface, a self evident advantage for the finished mill. Aluminium is not a hardener of steel and none of its alloys with steel in material proportions have so far proved advantageous. It has been proved that the addition of aluminium just before or during pouring causes the metal to lie quiet, and give off no appreciable quantity of gases, thus producing sounder ingots and castings. Blow holes in steel and iron are partly caused by the presence of carbonic oxide gas in the metal, and this gas is decomposed by the aluminium which unites with the oxygen forming alumina and setting free the carbon which appears as graphite. It also combines in some way with the hydrogen and nitrogen, either absorbing them or rendering them soluble in the steel. Aluminium is the principal dioxidizer known to metallurgists, the next being silicon; their relative effects being shown as follows:—100 parts by weight of oxygen will combine with 114 parts of aluminium or 140 parts of silicon or 350 parts of manganese. Moreover, the aluminium will entirely disappear if there is any oxygen present, and will only be found in the steel after all the oxygen has been absorbed. On the other hand, silicon is found in the steel even with oxygen still present. It is estimated that aluminium is five times as active as silicon in eliminating oxygen. In making ingots too much aluminium causes excessive piping and therefore a large loss from crop ends. Where the ingots are to be forged or rolled, from 2 to 4 ounces of aluminium to a ton of steel have been found advantageous. Larger amounts may be added to advantage where large ingots are to receive only scant working; here it seems to increase the ductility without altering the ultimate strength. Where freedom from blow-holes is the first consideration, *i.e.*, in steel castings, and where excessive piping and contraction in cooling is provided for by large runners and sink-heads, larger amounts are used to advantage. In tests of J. E. Stead one-tenth of 1 per cent. of aluminium added to that steel increased the weight and solidity and reduced blow-holes 23 per cent. Tests have shown that steel to which aluminium has been added will run through small passages without chilling better than ordinary steel; the reason is that the latter foams when in contact with cold surfaces and the flow is impeded to such an extent that the steel chills. The knowledge of this advantage is invaluable in the practice of open-hearth steel casting. The best results are only to be obtained by using a good grade of aluminium which contains no impurities. Scrap aluminium either in the shape of scrap or re-cast into ingots, is likely to contain elements which will be very harmful to the steel, two of the dangerous alloys being copper and zinc. Besides it is doubtful economy to use scrap because there is a very large surface exposed to oxidation before reaching the steel and the

loss is correspondingly greater, amounting in cases of thin scrap to 10% or sometimes 25%.

—JANNEY, STEINMETZ & Co., PHILADELPHIA, PA.

**ALUMINIUM SOLDER, RICHARDS.** The only aluminium solder producing reliable joints. Instruction for use: Use no flux, as the solder contains its own flux. Rub the surface of aluminium to be soldered with a stick of solder, applying heat at the same time with a blow pipe, so that the end of the stick is continually melting. The surface of the aluminium will thus become "tinned" with solder. After "tinning" it is best to rub the solder thoroughly into the surface while still fluid, with a clean metal scratch brush. The durability of the joints depends on the thoroughness of the "tinning," and the scratch brush insures perfect work. To make a lap or butt joint between two sheets, proceed as follows: After the surface has been "tinned" in the manner described there should be melted upon them sufficient solder for sweating the pieces together. It is difficult to get solder to flow into an aluminium joint. It must be put just where it is wanted in the first place. After the pieces have been thus prepared they can be placed in a position and the flame applied long enough to make the solder perfectly fluid, after which the joint is permitted to set, care being taken that the pieces do not move while the solder is still fluid. To make a lock joint the sheet should be coated with solder before it is turned over, or else the solder will not soak into the joint. If it is desired to solder a twisted joint, the wire should be "tinned," before the joint is made, after which the soldering can be done in the ordinary manner. To solder cables into a sleeve or into a switch terminal, clean and "tin" the wires individually. "Tin" the inside of the sleeve, or terminal, with aluminium solder. If a closed terminal is used, insert the cable and heat at the same time, feeding in the solder until the terminal is full, after which allow to cool.

—JANNEY, STEINMETZ & Co., PHILADELPHIA, PA.

**ALUMINIUM SULPHATE.** Iron free. In all grades for paper and color manufacturers and dyeing purposes.

—PENNSYLVANIA SALT MFG. Co., PHILADELPHIA, PA.

**ALUMINIUM WELDING.** See Welding, Oxy-Acetylene.

**ALUMINOTHERMICS.** The name given to the discovery made by Dr. Hans Goldschmidt that metallic oxides mixed in suitable proportion with finely divided aluminium, when ignited in one spot, continue their combustion throughout the whole mass without any supply of heat from outside. The temperature so created is extremely high—about 5,000 degrees F.—and is obtained within less than half a minute after ignition. The science of aluminothermics occupies itself with the application and utilization of the forces so created. (See "Welding Outfit—Thermit", "Welding Solid Iron and Steel Sections by the Thermit Process," "Welding—Thermit," "Pipe Welding by the Thermit Process," "Reinforcing Rods—

Welding by the Thermit Process," " Foundry Practice with Thermit" " Steel Castings by the Thermit Process," " Steel—Special," " Thermit," " Thermit Steel," and various metals free from carbon.)  
—GOLDSCHMIDT THERMIT CO., NEW YORK.

#### **ALUMINO-VANADIUM.**

—AMERICAN VANADIUM CO., PITTSBURGH, PA.

**AMALGAMATING PLANTS.** For gold ores. Large builders of all classes of machinery for such plants, the designs being based on an experience of many years. Catalog 6-C.

—COLORADO IRON WORKS CO., DENVER, COLO.

**AMALGAMATING RIFFLES.** For gold and silver ores in mills; also for placers, dredges, and cyanide works. These riffles will amalgamate more gold and silver than the flat plates as all of the fine or flour gold is brought to the amalgamated surface and cannot escape; and also the tarnished (or rusty gold) that is lost over the flat plates is recovered in these riffles.

—LUCIUS S. PIERCE, DENVER, COLO.

**AMERICAN INQOT IRON.** The purest iron manufactured (containing at least 99.8% iron). For use in all places where resistance to corrosion is essential. (See article by James A. Aupperle in *Met. & Chem. Eng'ing*, Vol. VIII, p. 262.)

—AMERICAN ROLLING MILL CO., MIDDLETOWN, OHIO.

**AMMONIA.** Aqua and anhydrous ammonia.

—GENERAL CHEMICAL CO., NEW YORK CITY.

**ANNEALING FURNACES.** See Furnaces Annealing.

**ANNEALING FURNACE, ELECTRIC.** See Furnace, Electric, Annealing.

**ANNEALING FURNACE BLOWERS.** See Blowers.

**ANODES.** May be of simple form or made up of a number of pieces. Various metals as well as carbon are used for this purpose. In many electrolytic processes this latter element is found to be more efficient when in the graphic form. Rods, slabs, hollow and solid cylinders, special shapes, etc., containing 99% graphic carbon are made. These readily lend themselves to the making of both simple and complex forms, since they can be machined in any way desired. Where moderate current densities per unit surface are required, efficiency and economy can be maximized by employing leading-in rods of graphite working at 100 to 150 amperes per square inch, threaded into graphite distributing slabs or blocks.

—INTERNATIONAL ACHESON GRAPHITE CO., NIAGARA FALLS, N. Y.

**ANODES, PLATING ELLIPTIC.** Cast in all standard commercial metals with square copper wire hooks attached. The great ad-



vantage in the use of these anodes is the uniformity of deposit as disintegration takes place from all sides of the anode. They are  $2\frac{1}{2}$  inches wide by  $1\frac{1}{2}$  inches thick. By the uniform wear of the anodes the solution is constantly kept in good condition. These anodes allow a free circulation of solution and wear as thin as a knifeblade, thus reducing the loss of metal to the smallest possible amount. (See paper by C. F. Burgess, *Electrochem. Ind.*, Vol. 1, p. 347.)

—HANSON & VAN WINKLE COMPANY, NEWARK, N. J.

**ANODES, PLATING SILVERITE.** Made in nickel, copper, and brass. Consist of two or more vertical rods from a cross horizontal top rod with suspension hooks. Large surface, uniform and even wear. The solution is kept thoroughly saturated with metal and is easily kept in good conditions.

—ZUCKER & LEVETT & LOBE CO., NEW YORK.

**ANODES, ZINC.** For electrical purposes.

—THE GRASSELLI CHEMICAL CO., CLEVELAND, OHIO, CHICAGO, ILL. AND NEW YORK.

**ANTIMONIAL LEAD.** See Lead, Antimonial.

**ANTIMONY, Black.** Powdered metallic antimony. Needle antimony. Antimony chloride, oxide, sulphide (crude and golden). Japanese ore.

—FUERST BROS & CO., NEW YORK.

**ANTIMONY.** "A. S. P." Brand English star antimony, for Babbitt (8.33% tin, 8.3 antimony, 8.3 copper); antifricition (80 lead, 15 antimony, 5 tin); Britannia (10 antimony, 90 tin); pewter (7.1 antimony, 1.8 copper, 1.8 bismuth, 89.3 tin); electrotype (87 lead, 8.7 antimony, 4.3 tin); linotype (83 lead, 12 antimony, 5 tin).

—C. W. LEAVITT & CO., NEW YORK CITY.

**ANTIMONY.** Commercially pure. "Ruthlock" Brand.

—MARCUS RUTHENBURG, LONDON.

**ANTIMONY RUBBER BELTING.** See Belting.

**AQUA AMMGNIA.** All strengths.

—THE GRASSELLI CHEMICAL CO., CLEVELAND, OHIO, CHICAGO, ILL. AND NEW YORK.

**AQUADAG.** An excellent lubricant. Differs from Oildag (which see) in that it is a colloidal solution or suspension of deflocculated Acheson graphite in water instead of oil. For air compressors, pneumatic tools or wherever oil is dangerous or objectionable. Unequalled for high speeds, because of its low viscosity. As a cutting fluid for thread or general lathe work it is superior to lard oil or any cutting compound.

—INTERNATIONAL ACHESON GRAPHITE CO., NIAGARA FALLS, N. Y.

**ARSENATE OF SODA.**

—PENNSYLVANIA SALT MFG. CO., PHILADELPHIA, PA.

**ATWOOD CRITCHLOW NESTS.** See Critchlow Nests.

**ATWOOD HYDRAULIC MANIFOLDS.** See Manifolds.

**ATWOOD VALVES.** See Valves.

**AUTOCLAVES.** Of cast-iron enameled ware. Tested for a pressure of 50 atmosphere.

—J. W. SITTIG, NEW YORK.

**AUTOCLAVE LINERS OF STONEWARE.** Very useful. They are cast out with lead or embedded in sand or kieselguhr. Also convenient for putting into calcium chloride baths.

—J. W. SITTIG, NEW YORK.

**BALL MILL.** See Crushing and Grinding.

**BARIUM BIOXIDE.** 86% and 90 to 92%.

—FUERST BROS. & CO., NEW YORK.

**BARIUM-CHLORIDE FURNACE.** See Furnace, Barium-Chloride

**BARREL PACKER.** See Packer.

**BASKETS, DIPPING.** Of hard rubber.

—AMERICAN HARD RUBBER CO., NEW YORK.

**BATTERIES—DRY.**

—**Flashlight.** Our principal sizes are for the tubular, coat pocket, and vest pocket types. Especially noted for long life, strong current and brilliant light. We also manufacture battery renewals for all types of flashlights on the market.

—NATIONAL CARBON CO., CLEVELAND, OHIO.

—**Ignition.** This class of service requires a battery that is capable of enduring strenuous work and must also render long service life. We have a number of types of ignition batteries but our leading one is Columbia ignitor. It is known for its efficient and reliable spark and its quick recuperative power which gives it long life.

—NATIONAL CARBON CO., CLEVELAND, OHIO.

—**Open-Circuit.** An open circuit battery remains out of work during most of its life, therefore it must be able to hold up in this open-circuit condition. Particularly long shelf life, uniformity of current drain and long service life are features of our Columbia brand. Especially adapted to telephones, electric bells, signal

service and similar use. Also a complete line of high grade open circuit cells at lower prices than that of the Columbia.

—NATIONAL CARBON CO., CLEVELAND, OHIO.

—**Rectangular.** Many classes of service require dry batteries that have a rectangular form instead of round. We have a complete line of sizes.

—NATIONAL CARBON CO., CLEVELAND, OHIO.

—**Special and Novelty Batteries.** A great many types of apparatus and toys require special dry batteries of odd shapes, sizes, connections, etc. We have a complete assortment of batteries for this class of work.

—NATIONAL CARBON CO., CLEVELAND, OHIO.

—**Waterproof.** Among our well known waterproof batteries may be mentioned (1) Autocell, four cells in series, enclosed in a metal case; (2) Multiplex, four cells in series, enclosed in wood case. (3) Series Multiple, various numbers of cells connected in series multiple, in either metal or wooden case. The number of batteries to be connected in series multiple depends on the class of service. (4) Tubular, three cells in series, connected end to end in a metal tube. It is particularly adapted to motor cycle and motor boat service.

—NATIONAL CARBON CO., CLEVELAND, OHIO.

### **BATTERIES—WET.**

—**Carbon Cylinder Cell.** Another form of sal-ammoniac cell which contains a carbon cylinder but no depolarizer. The zinc is in pencil form. This battery is for bells, signals and other light drain duties. No. 7 leads all others in this class.

—NATIONAL CARBON CO., CLEVELAND, OHIO.

—**No. 2 Carbon Porous Cup Cells.** A sal-ammoniac cell containing a depolarizer of manganese and carbon. A zinc cylinder surrounds the carbon cup and adds to its service and long life qualities. This battery is made in various sizes and is adapted to stationary gas engine ignition, telephones, fire alarms signals, etc. Our leading cell of this type is No. 2.

—NATIONAL CARBON CO., CLEVELAND, OHIO.

—**Copper Oxide Cell.** A closed circuit cell containing a solution of caustic soda, zinc and a depolarizer of copper oxide. On account of the ratio of the ingredients this cell is capable of remaining in closed circuit for long periods of time without being run down. Particularly adapted to railroad signal service of various forms.

—NATIONAL CARBON CO., CLEVELAND, OHIO.

**BATTERY CHARGING.** Westinghouse automatic battery-charging outfit. For converting alternating current to direct current for

battery charging purposes or delivering moderate quantities of direct current.

—WESTINGHOUSE ELECTRIC & MFG. CO., PITTSBURGH, PA.

**BATTERY FILLER.** Acheson graphite for dry-battery filler is made in two leading grades, "Ba2" and "Bb1," besides any desired size of lump or granular graphites, or any mixture of sizes. "Ba2" is a fine powder, guaranteed 92% graphite carbon. "Bb1" is not quite so finely ground, contains 98% graphitic carbon and is of different texture from the "Ba2." All are practically free from iron, of uniform quality, chemically inert, contain no volatile matter, and possess high electrical conductivity.

—INTERNATIONAL ACHESON GRAPHITE CO., NIAGARA FALLS, N. Y.

**BATTERY FLUID.** Electrolyte of various strengths to suit the requirements of all makes of storage batteries.

—THE WESTERN CHEMICAL MFG. CO., DENVER, COLO.

**BAUXITE ORE.** French, for the manufacture of aluminium.

—CONTINENTAL AMERICAN ORE COMPANY, BOSTON, MASS.

**BAUXITE.**

—PENNSYLVANIA SALT MFG. CO., PHILADELPHIA, PA.

**BAUXITE BRICK.** See Brick, Bauxite.

**BEET SUGAR MACHINERY.** Multiple effects, strike pans, diffusion batteries, crystallizers, heaters, beet wheels and washers, and mechanical filters.

—SWENSON EVAPORATOR CO., CHICAGO, ILL. (formerly American Foundry & Machinery Co.)

—ZAREMBA CO., BUFFALO, N. Y.

**BELTING, GUTTA BALATA.** An absolutely seamless belt. Made under Forsyth's Patent. Can be run with either side next the pulleys, and is practically unaffected by oils or grease. Made stapled; also supplied plain without staples. The duck used in this belt is so woven that stretch is reduced to the minimum. A 4-ply Gutta Balata belt is equal to a 5-ply rubber or canvas belt.

—BOSTON BELTING COMPANY, BOSTON.

**BELTING, RUBBER.** Made of a specially woven duck of great tensile strength and high-grade rubber. Adapted for use in damp or wet places, either for the transmission of power or conveying of materials. Conveyor belts supplied, when desired, with an extra thick rubber cover to overcome injury to the belt by abrasion. "Boston" and "Niagara" grades especially recommended for satisfactory service and durability. "Imperial" is a stitched rubber belt, in which there are rows of stitches of long stapled cotton yarn running the entire length of the belt, about 1" apart. "Imperial" Stitched Belting is well adapted for hard and severe work.

—BOSTON BELTING COMPANY, BOSTON.

**BELTING, RUBBER.** Not affected by dampness, nor by changes in temperature. Absolutely uniform in width and thickness. Our belting being thoroughly stretched in manufacture, the tendency to elongate in service is reduced to a minimum. A three or four ply is equal to a single, and five or six ply is equal to a double leather belt. It can be reversed and either side run next to the pulleys. Seamless belting. Our brands: Giant ("the original stitched belt, and the best belt ever made"), Granite, Beacon, Shawmut, Special brands, Four Ace Matchless, Special Elevator, Silvertown Elevator, Special Conveyor, Shawmut Conveyor, V. Z., Pilot. Conveyor belting, concentrator belts, ore elevator belting.

—REVERE RUBBER CO., BOSTON, MASS.

**BICARBONATE OF SODA.** Natrona. For baking powder and drug purposes.

—PENNSYLVANIA SALT MFG. CO., PHILADELPHIA, PA.

**BICARBONATE OF SODA.**

—THE SOLVAY PROCESS COMPANY, SYRACUSE, N. Y.

**BICHLORIDE OF TIN.**

—GOLDSCHMIDT DETINNING CO., NEW YORK CITY.

**BISULPHIDE OF CARBON.** See Carbon bisulphide.

**BLAST FURNACES.** See Furnaces, Blast, also Furnaces, Smelting.

**BLAST NOZZLE OR VENTILATOR.** Made of hard lead and used in chemical works for creating draft at the end of the chamber system. By installing this nozzle in the flue, the same condition of draft can be had on the burners and in the chambers, independent of variations of the atmosphere. On account of the proper construction and proportioning of the nozzles, the consumptions of steam is very small. These blast nozzles are manufactured in two styles, one with fixed steam nozzle, and the other with removable steam nozzle. The latter has the advantage that the steam nozzle can be replaced without taking the blast nozzle out of the flue. Catalog KK-4.

—SCHUTTE & KOERTING CO., PHILADELPHIA, PA.

**BLEACHING.** See bleaching powder; bleaching liquor; chlorine; hypochlorite; oxone; ozone; palm oil bleacher; perborate sodium; peroxide calcium; peroxide strontium; sulphur; sulphur dioxide.

**BLEACHING LIQUOR.** An electrolytic cell for continuous production of sodium hypochlorite (bleaching liquor) from sodium chloride for bleaching, disinfecting, etc. A 4% solution of salt flows by gravity into the cell, while a 110-volt direct current is passed through it. The solution flowing off (bleaching liquor or hypochlorite) contains four to five grams available chlorine per liter.

Sodium hypochlorite is a strong oxidizing agent quickly attracting any organic matter in cloth or vegetable fibers. The apparatus is of great convenience for use in laundries and in general where a bleaching or disinfecting operation is to be carried out. The solution contains no free chloride or alkali, thus being perfectly harmless to fibers. The compounds are readily soluble; therefore, it imparts no harshness to the cloth.

—NATIONAL LAUNDRY MACHINERY CO., DAYTON, OHIO.

**BLEACHING LIQUOR.** Production of sodium hypochlorite by electrolysis of salt solutions, for bleaching purposes of all kinds. For bleachers, laundries, cotton mills. Estimates on request.

—SIEMENS & HALSKE CO., NEW YORK.

**BLEACHING POWDER.** Chloride of lime, made from chlorine, produced electrolytically.

—ARNOLD, HOFFMAN & CO., PROVIDENCE, R. I.

—CASTNER ELECTROLYTIC ALKALI CO., NIAGARA FALLS, N. Y.

—GENERAL CHEMICAL CO., NEW YORK.

—GENERAL CHEMICAL CO. OF PENNSYLVANIA, PITTSBURGH, PA.

—HOOKER ELECTROCHEMICAL CO., NEW YORK AND NIAGARA FALLS, N. Y.

—PENNSYLVANIA SALT MFG. CO., PHILADELPHIA.

### **BLOCKS, CUPOLA.**

—ASHLAND FIRE BRICK CO., ASHLAND, KY.

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**BLOWERS.** Monarch Rotary Low-Pressure. Constructed capacities up to 350 cubic feet of free air per minute, economical, require little horsepower. A good suitable article that is well made, guaranteed free from imperfections and of superior workmanship.

—MONARCH ENGINEERING & MFG. CO., BALTIMORE, MD.

**BLOWERS, Fans.** Positive pressure blowers.

—ROCKWELL FURNACE CO., NEW YORK.

**BLOWERS.** Positive pressure blowers for handling air or gas up to 10 lbs. pressure. Belt or motor driven. Capacities from 50 to 1,000 cu. ft. per minute. Suitable for air blast for furnaces using oil or gas fuel, sand blasts, exhausting gas from gas producers, etc.

—W. S. ROCKWELL COMPANY, NEW YORK.

**BLOWERS.** Piqua positive; also exhausters; also called rotary, air or gas pumps. For maintaining either pressure or vacuum up to 8 pounds per square inch. The smallest size has a capacity to deliver 5 cu. ft., medium size 15,000 cu. ft., special sizes up to 50,000 cubic feet per minute. Belt, electric, motor, or engine-driven. Best and most economical for gold-copper and silver-lead smelters; gray-iron cupola furnaces; side blow steel converters, and all kinds of furnaces fired by coal, coke, gas or oil. Also for cooling, purify-

ing, agitating or evaporating liquids, etc. Used with gas generators or producers also as gas boosters, etc. Two impellers exact duplicates. Doing equal work. No contact of internal parts. No heating. No friction. Self-oiling. Adjustable. Rugged and simple. Catalog M-10.

—THE PIQUA BLOWER COMPANY, PIQUA, OHIO.

**BLOWERS, (LEAD STEAM-JET,) AND VENTILATORS.** For moving gases, etc. in chemical and allied industries. These blowers and ventilators are constructed on the order of an injector, that is, with a nozzle for the purpose of giving the air great velocity with a minimum steam pressure. They occupy little space in comparison to capacity in cubic feet of air moved per hour, viz.: Capacity 60,000, dimensions 52 $\frac{3}{8}$ " high x 13 $\frac{1}{2}$ " wide. Standard sizes are, 8,000, 16,000, 30,000, 60,000, and 120,000 cu. ft. per hour. To give strength and wear to the steam nozzle, the nozzle is lined with platinum or other desirable material to suit requirements.

—SCHUTTE & KOERTING CO., PHILADELPHIA, PA.

**BLOWERS, ROTARY LEAD FAN.** Especially designed and constructed for the chemical industry, and may be placed between the Glover tower and the first chamber, or between two Gay-Lussac towers, or at the end of the system. The body of the fan is constructed entirely of hard lead; the shaft being lead covered. The construction is so that discharge may be had in any of four directions—vertically, top or bottom, and horizontally in either direction; may be belt or motor driven as desired; operated at high or low speed, and is provided with self-oiling devices. Result: Continuous draft, increased production, economic operation. Built in eight sizes, with output of 730 to 6,800 cu. ft. per minute. Catalog LL-4.

—SCHUTTE & KOERTING CO., PHILADELPHIA, PA.

### **BLOWING ENGINES.**

—ALLIS-CHALMERS CO., MILWAUKEE, WIS.

**BLOWPIPE, OXY-ACETYLENE.** See Welding, Oxy-acetylene, and cutting, Oxy-acetylene.

**BLOWPIPE, OXY-HYDROGEN.** See Welding, Oxy-hydrogen.

**BOILERS, STEAM (DOPP).** The Cookers, also called Caldron furnaces, are provided with fire box, grate and smoke stack and are used for heating, also evaporating, concentrating where steam is not available. The small boilers are designed for low pressure steam to be used for heating steam-jacketed kettles or vacuum pans or for any other purpose, for canning, preserving, cooking hams and making sausage, boiling spray for insecticide. A licensed engineer is not required to operate these boilers, as only low pressure steam is generated. At the same time they are perfectly safe, being

tested to one hundred pounds per square inch of hydrostatic pressure.

—SOWERS MFG. CO., BUFFALO, N. Y.

**BOILER COMPOUND.** Tri-sodium phosphate for softening water. Removes scales and prevents incrustations in boilers.

—THE GRASELLI CHEMICAL CO., CLEVELAND, OHIO, CHICAGO, ILL. AND NEW YORK.

**BOILER SETTING BRICK.** See Brick, Boiler Setting.

**BOILER TILE.**

—ASHLAND FIRE BRICK CO., ASHLAND, KY.

**BOILING TUBES.** Heating Coils of stone-ware.

—J. W. SITTIG, NEW YORK.

(Other stoneware makers see Stoneware.)

**BOILING VESSELS** for the manufacture of picric acid of acknowledged quality and greatest durability. Covers arranged for hydraulic seal or ground on.

—J. W. SITTIG, NEW YORK.

(Other stoneware makers see Stoneware.)

**BOOKS.** Reports, Transactions, Proceedings and Year Books of the different chemical, mining, electrical, civil engineering, etc., societies supplied promptly and at moderate rates. Any U. S. Government Report or Bulletin furnished at short notice.

—A. W. CASTELLANOS, JERSEY CITY, N. J.

**BOOKS. PUBLISHERS AND BOOKSELLERS.** All scientific, engineering and technical books of *all publishers*. The largest distributors of engineering books of all classes in the country. Electrochemical, chemical, mining, metallurgical, electrical, civil, mechanical and all other lines carried in stock. The book department of the following standard technical journals: American Machinist, Electric Railway Journal, Electrical World, Engineering and Mining Journal, Engineering Record, Power and The Engineer, Metallurgical and Chemical Engineering. All publications of the McGraw-Hill Book Company are "net" and not subject to discount. On books that are subject to discount the maximum discounts are always given. Special pains taken in the recommendation of books for any problem. Importers of foreign books as well.

—MCGRAW-HILL BOOK COMPANY, NEW YORK.

**BOTTLES.** Of hard rubber for acids, etc.

—AMERICAN HARD RUBBER CO., NEW YORK.

**BOTTLES** for storing distilled water, round or rectangular form of acid proof stoneware.

—J. W. SITTIG, NEW YORK.

(Other stoneware makers see Stoneware.)



**BRASS FURNACE LININGS.** See Linings.

**BRAZING FURNACES.** See Furnaces Brazing.

**BRICK. ACID PROOF.**

—DIDIER-MARCH CO., NEW YORK.

—HARBISON-WALKER REFRACTORIES CO., PITTSBURGH, PA.

—**Acid-proof.** Vitrified chemical rings for packing acid towers.

—LACLEDE-CHRISTY CLAY PRODUCTS CO., ST. LOUIS, MO.

—**Acid-proof bricks** ranging in size from that of common brick or less, to tile 24" x 40". These bricks and tiles are used for lining acid tanks, cooling floors, etc., etc. Can be used in any capacity requiring acid-proof brick or tile.

—U. S. STONEWARE CO., AKRON, OHIO.

—**Acid proof of fused silica.** (See also Quartz, Fused in Part II of this Dictionary).

—THE THERMAL SYNDICATE, LTD., NEW YORK.

**BRICK, BAUXITE.** A refractory for steel furnaces, lead refining furnaces, lining for rotary portland cement kilns. See article by A. J. Aubrey, *Electrochem. and Met. Industry*, Vol: IV, p. 52.

—LACLEDE-CHRISTY CLAY PRODUCTS CO., ST. LOUIS, MO.

**BRICK, BLAST FURNACE.**

—ASHLAND FIRE BRICK CO., ASHLAND, KY.

**BRICK, BOILER DOOR ARCHES.**

—ASHLAND FIRE BRICK CO., ASHLAND, KY.

**BRICK, BOILER SETTING.**

—ASHLAND FIRE BRICK CO., ASHLAND, KY.

—HARBISON-WALKER REFRACTORIES CO., PITTSBURGH, PA.

**BRICK, CHEMICAL WORKS.**

—ASHLAND FIRE BRICK CO., ASHLAND, KY.

**BRICK, CHROME.** The ideal neutral refractory brick. Practically infusible and dense in structure. Used in basic and open-hearth steel furnaces (as a neutral course between the fire-clay brick on the bottom plates and the magnesia brick forming the foundation for the hearth or furnace bottom; for the floors of ports and the facing of port walls and backwalls of uptakes; also useful for making quick repairs in furnace at working heat, as they are not affected by sudden changes of temperature); in soaking pits (six or eight courses in the bottoms); in coal-fired heating furnaces (along the slag line); in copper smelting and refining plants in the bottom courses and around the tap holes of blast furnaces and in lining settlers (along the slag line and around the tap holes) and in lining

converters (next to the shell); in lead softening and refining furnaces and many special furnaces; also in rotary cement kilns.

Chrome brick should be laid in finely ground chrome ore (with the exception of the lining of converters next to the shell, where they should be laid in magnesite cement instead of chrome ore, the former sticking well to iron work). Chrome brick expand slightly at high temperatures. They should not be subjected to excessive weight when hot.

—HARBISON-WALKER REFRACTORIES CO., PITTSBURGH, PA.

### **BRICK, COKE OVEN.**

—ASHLAND FIRE BRICK CO., ASHLAND, KY.

**BRICK, FIREBRICK.** For all purposes of the chemical and metallurgical industries. Highest-grade fine-grind and hard-burn fire brick for use in sulphite digesters. Rotary cement kiln linings. Lime kiln linings. Fire brick and chrome linings for nodulizing kilns for iron ore and other material. Fire brick for soda ash furnaces, salt cake and other chemical furnaces. Linings for pyrites roasters. Chrome and fire brick linings for dolomite calcining kilns; magnesia and fire brick for calcium carbide kilns; highest-quality fire-clay brick for brass furnaces. Fire, silica, and quartzite brick for all types of beehive, by-product and Belgian types of coke ovens. Special brick for boiler settings. Total daily capacity of all works 1,100,000 brick. See also Chrome Brick, Magnesia Brick, Silica Brick.

—HARBISON-WALKER REFRACTORIES CO., PITTSBURGH, PA.

—Firebrick. For foundries and all purposes. Blast furnace brick. Brick for boiler door arches, hot blast stoves, coke oven, etc. Special firebrick.

—ASHLAND FIRE BRICK CO., ASHLAND, KY.

—Firebrick. Made from selected clays for all purposes.

—LACLEDE CHRISTY CLAY PRODUCTS CO., ST. LOUIS, MO.

**BRICK, MAGNESIA.** The ideal basic refractory brick. For use in basic open-hearth steel furnaces (where a number of courses of magnesia brick are used in making the foundation for the bottom; in building the sidewalls to a height of about 15 inches above the bottom of the charging doors; around the door jambs and tapping holes, and to face the furnace blocks as a protection to the silica brick; also in the bulkheads of the ports; and in six or eight courses of magnesia brick as the top courses in the gas checkers); in the construction of soaking pits (six or eight bottom courses); in metal mixers (along the slag line); in billet and bar furnaces running on producer or natural gas (in the bottom and on the bridge wall); in copper reverberatories (in the bottom, side walls and on the bridge wall to take the splash of the metal); in copper converters (which are, next to the shell, lined with one course of magnesia brick laid in magnesite cement); in special types of furnaces, such as

silver slimes, dross, and bullion furnaces; electrical smelting, heating welding, and melting furnaces; calcium carbide kilns, etc.; in rotary cement kilns (in the burning zone). Magnesia brick is indispensable for lining electric ferro-alloy furnaces. In electric steel furnaces a lining of magnesia brick permits the use of a highly basic slag to completely desulphurize the metal. In chemical industries magnesia brick is indispensable, wherever the best basic refractory is required.

Magnesia brick should be laid in magnesite cement. They are very good conductors of heat, and where this heat conductivity would injure the plate work they should be backed up with some other high-grade material which is a poor heat conductor. They expand slightly at high temperatures. They are better conductors of electricity than porcelain at 2,000 degrees F. or over; at low temperatures their electrical conductivity is less than porcelain. The best results are obtained from magnesia brick in furnaces where continuous heats are used. Great variation of temperature, exposure while hot to currents of cold air or to contact while hot with water or oil, will cause them to shatter and spawl. Magnesia brick should not be subjected to excessive weight when hot.

—HARBISON-WALKER REFRACTORIES COMPANY, PITTSBURGH, PA.

#### **BRICK, MAGNESITE.**

—ATKINS, KROLL & CO., SAN FRANCISCO, CAL.

#### **BRICK, MILL**

—ASHLAND FIRE BRICK CO., ASHLAND, KY.

#### **BRICK, OPEN-HEARTH.**

—ASHLAND FIRE BRICK CO., ASHLAND, KY.

#### **BRICK. SILICA BRICK.**

—ATKINS, KROLL & CO., SAN FRANCISCO, CAL.

—**Silica Brick.** Of highest quality. The ganister rock used in W. Star, our East Chicago brand, comes from the Wisconsin deposits. W. Star in every way is a high-grade silica brick for open-hearth furnaces, glass furnaces, or for any purposes where the best silica brick are required. 20 standard shapes, other shapes made to order.

—HARBISON-WALKER REFRACTORIES CO., PITTSBURGH, PA.

**BRIQUETTING PRESSES AND COMPRESSORS.** A new type of continuous acting rotary briquetting press. Used largely for compressing small cakes. Can be furnished for briquetting coal, coke, etc.

—F. J. STOKES MACHINE CO., PHILADELPHIA, PA.

#### **BUCKETS.** Hard rubber.

—AMERICAN HARD RUBBER CO., NEW YORK.

#### **BUCKETS.** Coal and ore grab. Automatic shovel-tubs.

—THE BROWN HOISTING MACHINERY CO., CLEVELAND, OHIO.

**BUFF, TRIPLEX FOR ELECTROPLATERS.** The feature is the fold, the object being to produce a cross-cutting or diagonal surface on the cutting face of the buff, the buff being made of a succession of folds so formed as to offer a greater surface to the work and at the same time to save composition. The mesh of the fabric crossing prevents the material pulling out or fraying on the working edge. The triplex buff uses up every strand of thread in the wheel. When the wheel is worn down to say 7", the stubs may be returned and, at a nominal cost, remade into a 12" wheel of approximately double the diameter of the worn-down wheel, using two wheels so returned to make one new wheel. In this way the user has one and one-half buffs at the price of one. The triplex buff wears at least twice as long as the ordinary buff, and the saving of composition is as much as 20%.

—ZUCKER & LEVETT & LOEB CO., NEW YORK.

**BUFFING LATHE.** See Lathe.

**BURNERS.** For gasoline. Highest operating efficiency obtained by this design, which has been in successful use for 30 years.

—HOSKINS MANUFACTURING COMPANY, DETROIT.

**BURNERS.** Fuel oil or gas. For miscellaneous requirements; can be attached to various retorts, cupelling furnaces, or used for annealing and welding, etc.

—MONARCH ENGINEERING & MFG. CO., BALTIMORE, MD.

**BURNERS.** For oil or gas. Seven different styles—steam, air or combination. All parts accessible, all interchangeable. Simple, reliable, powerful, durable, economical, suitable for light or heavy oils. More in use than all others combined. Price includes valves and unions complete. Catalog 3.

—W. S. ROCKWELL COMPANY, NEW YORK.

**BURNERS.** For oil or gas. Seven different styles—steam, air or combination. All parts accessible, all interchangeable. Simple, reliable, powerful, durable, economical, suitable for light or heavy oils.

—ROCKWELL FURNACE COMPANY, NEW YORK.

**BURNERS.** For welding. See Welding.

**BURNISHING POTS.** Of acid-proof stoneware, in various sizes, with and without handles.

—DIDIER-MARCH CO., NEW YORK.

(Other stoneware makers see Stoneware.)

**BUSHINGS.** Bushings, Washers, Discs and other small carbon articles formerly made in molds can frequently be far more economically produced by machining from solid Acheson-Graphite rods. High electrical conductivity, purity (99%), smoothness, lubricating

properties, resistance to oxidation and disintegration, and non-arcng properties are important considerations in this connection.

—INTERNATIONAL ACHESON GRAPHITE COMPANY, NIAGARA FALLS, N. Y.

**CABLE PRESS.** See Press, Lead Cable.

**CABLEWAYS.**

—THE BROWN HOISTING MACHINERY CO., CLEVELAND, OHIO.

**CADMIUM.** Metallic, in sticks. Cadmium sulphide.

—THE GRASELLI CHEMICAL CO., CLEVELAND, OHIO, CHICAGO, ILL. AND NEW YORK.

**CALCIUM CARBIDE.** Made in the electric furnace. In contact with water, it develops acetylene gas.

—UNION CARBIDE CO., CHICAGO AND NEW YORK.

**CALCIUM CHLORIDE.** For refrigerating purposes and for laying of dust on roads. Solid 75%, granulated 75%, liquid 40.50%.

—THE SOLVAY PROCESS COMPANY, SYRACUSE, N. Y.

**CARBONS.** A general term frequently applied to electrodes and terminals of carbon, whether of the graphitic or amorphous variety. In electrometallurgical work Acheson graphite carbons allow 125 to 250 amperes per square inch. Readily threaded for connections and for joining to avoid waste ends. Are of pure graphite throughout, hence highly resistant to disintegration. Well adapted to steel furnaces, particularly in reducing atmosphere. Equally applicable in arc or resistance furnace work.

—INTERNATIONAL ACHESON GRAPHITE CO., NIAGARA FALLS, N. Y.

**CARBONS, ARC LAMPS.** A large assortment of sizes in several grades for open and enclosed arcs, flaming arc, moving-picture machines and search-lights.

—NATIONAL CARBON CO., CLEVELAND, OHIO.

**CARBON BISULPHIDE.** Shipped in drums. Made in the electric furnace. Special goods for fine uses. Used for extracting oil from seeds, wool, bones, etc.; as a disinfectant; as an exterminator of insects and small animals; with chloride of sulphur for vulcanizing india rubber, etc. Detailed information on request.

—E. R. TAYLOR, PENN YAN, N. Y.

**CARBON BRUSHES.** For generators, motors, dynamos of all sizes, forms and styles of manufacture—in plain form or with any style of connection. We can supply particular grades with reference to conductivity, abrasiveness, lubrication, long life and other special features, when given specifications and operating conditions. Our leading brands are Partridge, Columbia and Laclede.

—NATIONAL CARBON CO., CLEVELAND, OHIO.

**CARBON ELECTRODES, AMORPHOUS.** Especially made for efficiency and long life. We have been supplying these for electric furnaces for the manufacture of aluminium, ferro-alloys, electric steel smelting, and the manufacture of metallic sodium and caustic soda. The above classes of service only constitute a small portion of the possibilities of uses for which our high grade electrodes are used. We can supply these carbons in any size, graphitized or not, as the service requires.

—NATIONAL CARBON CO., CLEVELAND, OHIO.

**CARBON ELECTRODES, AMORPHOUS.** Of best quality and particularly adapted to the manufacture of dry cells. There is also a large demand for special electrodes used in connection with wet cell work.

—NATIONAL CARBON CO., CLEVELAND, OHIO.

**CARBON ELECTRODES, AMORPHOUS.** (Girod) of great strength and durability. For electric furnace work, like steel refining.

—C. W. LEAVITT & Co., NEW YORK.

**CARBON FLOUR.** A complete assortment of carbon flour of first-class quality and in any standard size. Adapted to many uses, among which may be named:—Packing incandescent lamp filaments for baking and in the manufacture of dry batteries.

—NATIONAL CARBON CO., CLEVELAND, OHIO.

**CARBON, GLOBULAR.** For telephone work and various forms of experimental work, in practically any desired screen sizes.

—NATIONAL CARBON CO., CLEVELAND, OHIO.

**CARBON, GRANULAR.** A high grade of granular carbon in any degree of fineness, especially adapted for special classes of resistors and in connection with rheostats. A great many experimental laboratories construct their rheostats so as to use granular carbon instead of a mechanical rheostat, as it gives better control over the current.

—NATIONAL CARBON CO., CLEVELAND, OHIO.

**CARBON PACKING RINGS FOR STEAM TURBINES.** We can turn out the segments in any size, upon receipt of specifications and can assure accuracy of the highest degree. They are smooth in the bearings and form a perfect steam-tight packing. Their life is exceedingly long, as they wear very slowly. By the use of our carbon segments a saving of fuel will be realized as well as a perceptible decrease in lost power and a reduction in the depreciation of machines.

—NATIONAL CARBON CO., CLEVELAND, OHIO.

**CARBON RESISTORS.** Of many varieties and of good qualities. We can supply practically all sizes and lengths in such forms as

strips, rods, discs, etc., used in connection with electric furnace work.

—NATIONAL CARBON CO., CLEVELAND, OHIO.

**CARBON SPECIALTIES, AMORPHOUS.** Upon receipt of specifications we are prepared to furnish the highest grade of carbon products of any nature. Among our specialties are muffles for electric furnaces, carbon plates, rods, bricks, sticks, small tubes, discs for resistors, contacts, and carbon molded into special shapes.

—NATIONAL CARBON CO., CLEVELAND, OHIO.

**CARBON TUBES.** A complete assortment of diameters, wall thicknesses and lengths for all classes of service. The largest portion of our tube products are used in making electric furnaces for electrically baking or metallizing incandescent lamp filaments. Also tubes for resistors. Also used in connection with electric furnaces for the insertion of pyrometers, or the conduction of gases etc. Large stock, and every facility for making special tubes according to specifications.

—NATIONAL CARBON CO., CLEVELAND, OHIO.

**CARBONIZING FURNACES.** See Furnaces Carbonizing.

**CARBORUNDUM.** A chemical compound of carbon and silicon, having the formula  $\text{SiC}$  (silicon carbide). It is made in the electric furnace from coke and sand and contains 70% of silicon and 30% of carbon, with negligible amounts of iron and aluminium. Specific gravity 3.12. Specific heat .185. Hardness between 9.5 and 10. It is the hardest of all known materials except the diamond. It is infusible at all temperatures except those of the electric furnace and decomposes at about  $2250^{\circ}\text{C}$ . It is insoluble in all acids, but is dissolved in fused alkalis. Its principal use is as an abrasive in the manufacture of grinding wheels and sharpening stones. Carborundum is also widely used as a refractory material and as a substitute for ferro-silicon in the manufacture of steel, and the grade for this purpose contains 62% silicon, 35% carbon and 3% iron and aluminium. It is added directly to the ladle and is a powerful deoxidizing agent.

—CARBORUNDUM COMPANY, NIAGARA FALLS, N. Y.

**CARBORUNDUM FIRE SAND.** Also called amorphous carborundum, made in the outer zone of the carborundum furnace. A greenish granular material having a specific gravity of about 2.9. It is widely used as a refractory, especially in oil burning furnaces. The mixture commonly used is carborundum fire sand 70%, ground fire clay 15%, silicate of soda ( $52^{\circ}$  Beaume) 8% and water 7%. This mixture weighs about 85 pounds per cu. ft. and is used in crucible brass furnaces and oil burning furnaces for melting brass.

—CARBORUNDUM COMPANY, NIAGARA FALLS, N. Y.

**CARBOYS.** With plain or screw stoppers, all made of acid-proof stoneware.

—**DIDIER-MARCH COMPANY, NEW YORK.**

(Other stoneware makers see Stoneware.)

**CASE HARDENING FURNACES.** See Furnaces, Case Hardening.

**CASTINGS (miscellaneous)** for iron and steel works.

—**MACKINTOSH, HEMPHILL & Co., PITTSBURGH, PA.**

**CASTINGS.** For blast furnaces, hot-blast stoves, steel works, etc.

—**SCAIFE FOUNDRY AND MACHINE Co., LTD., PITTSBURGH, PA.**

**CASTINGS, AIR FURNACE IRON.** This iron is used for the finest castings. The sulphur is very low. The lower graphite carbon makes a dense, fine grained iron of great strength. This iron is especially adapted for high-pressure cylinders and pumps and ammonia compressors. This metal has great wearing power, with considerable ductility. The chemical composition can be regulated to produce metal of any degree of hardness or chill.

—**BUFFALO FOUNDRY & MACHINE COMPANY, BUFFALO, N. Y.**

**CASTINGS, CHEMICAL.** Specially designed to resist the action of various acids, such as nitric acid retorts, muriatic acid pans, acetic acid stills, sulphuric acid stills, sulphuric acid evaporating pans, nitre hogs, acid lifts, also a specialty of castings made from blue prints furnished by designers, engineers and superintendents of plants. Plans or estimates furnished for complete acid and chemical plants.

—**BETHLEHEM FOUNDRY & MACHINE Co., SOUTH BETHLEHEM, PA.**

**CASTINGS, CHEMICAL.** Made from the purest iron, with additions necessary to make the iron resist the action of corrosive chemicals. Special methods of moulding are introduced to insure the longest life to the casting under working conditions. All mixtures are made up from a chemical basis. Chemical castings made by this Company have in many cases greatly reduced the casting cost to customers, on account of the longer life they are able to obtain from their use.

—**BUFFALO FOUNDRY & MACHINE COMPANY, BUFFALO, N. Y.**

**CASTINGS, GREY IRON.** Heavy castings are made of the best quality of pig iron and scrap. The metal is designed for the softest, easily machined casting and also for varying grades of harder, close grained iron up to mottled or white iron. The chemical composition of each grade is carefully determined. The foundry is equipped with travelling cranes of great capacity so that castings of 200 tons weight may be handled with ease. All fuels, fluxes and pig iron used in the manufacture are tested and the products of the



foundry are rigidly inspected. Breaking tests of the various grades of iron are made on a powerful testing machine.

—BUFFALO FOUNDRY & MACHINE CO., BUFFALO, N. Y.

**CASTINGS, SEMI-STEEL.** Made by melting soft steel with pig iron and scrap. It may contain small or large amounts of steel according to the demands made upon the metal. It has taken the place of the highest priced charcoal iron for most work. It will give a tensile strength of 30,000 to 40,000 lbs. per square inch. On a transverse strain it shows a good deflection, indicating toughness. It resists abrasion and shock, and is used for grinding machinery, rollers, etc.

—BUFFALO FOUNDRY & MACHINE COMPANY, BUFFALO, N. Y.

**CAST IRON ENAMELED.** See Enameled Ware.

**CASTNER-KELLNER CELL.** See Cells, Electrolytic.

**CAUSTIC POTS.** See evaporating pots.

**CAUSTIC SODA.** Liquid and fused. (See Cells, electrolytic).

—ARNOLD, HOFFMAN & CO., PROVIDENCE, R. I.

—CASTNER ELECTROLYTIC ALKALI CO., NIAGARA FALLS, N. Y.

—HOOKER ELECTROCHEMICAL CO., NEW YORK.

—PENNSYLVANIA SALT MFG. CO., PHILADELPHIA, PA.

—THE SOLVAY PROCESS COMPANY, SYRACUSE, N. Y.

**CAUSTIC SODA EVAPORATORS.**

—SWENSON EVAPORATOR CO., CHICAGO, ILL. (Formerly American Foundry & Machinery Co.)

(Other manufacturers of evaporators see under Evaporators.)

**CAUSTICIZING APPARATUS ON PRESSURE SYSTEM.** By causing the reaction to occur under pressure and at high temperature, it is completed very quickly, producing a concentrated solution with high yield of caustic. This system effects a great saving in coal, labor, time, and floor space. The sludge filters are fitted with adjustable agitators, yielding a clear liquor, and permitting quick and efficient washing with very small loss of caustic and little expenditure of labor. Owing to the greatly reduced amount of evaporation necessary in this system, the capacity of existing plants can be greatly increased by its substitution for causticizers working at atmospheric pressure.

—ZAREMBA COMPANY, BUFFALO, N. Y.

**CELLS, ELECTROLYTIC.** *For alkali chloride electrolysis for the production of chlorine (for bleaching powder and other purposes) and caustic soda or potash from common salt (sodium chloride) or potassium chloride respectively.*

**Castner-Kellner Cell.** Mercury Cathode. Description in Electrochemical Industry, Vol. 1, p. 12.

—CASTNER ELECTROLYTIC ALKALI CO., NIAGARA FALLS, N. Y.

**Townsend Cell.** A diaphragm cell. Descriptions in *Electrochemical and Metallurgical Industry*, Vol. V, p. 209, 301, and Vol. VII., page 313.

—HOOKER ELECTROCHEMICAL CO., NEW YORK.

Another diaphragm cell.

—PENNSYLVANIA SALT MFG. CO., PHILADELPHIA, PA.

**CELLS, ELECTROLYTIC.** For the electrolytic production of bleaching liquor (hypochlorite) from common salt solutions. (See also *Bleaching Liquor*.)

—NATIONAL LAUNDRY MACHINERY CO., DAYTON, OHIO.

—SIEMENS & HALSKE CO., NEW YORK.

**CELLS, LEACHING.** (Also called "Diffusion Batteries"). For the lixivation of black ash, alkaline earths, etc., and for the extraction by diffusion process of sugar from sliced beets and similar work. Shells of cells made of steel, cast iron or copper, with lining of lead or cement when necessary. Automatic feed if desired. Discharge through drop-bottom, cone or swinging-side-door; also through swinging bottom with hydraulic closure. Cells proportioned to suit the material handled. Batteries arranged in single or double-line or in circuit.

—ZAREMBA COMPANY, BUFFALO, N. Y.

**CELLS, LEACHING.** See also Diffusion batteries.

**CEMENT-KILN LININGS.** See Linings.

**CENTRIFUGAL MACHINES.** For separation of liquids from solids by centrifugal force. See description in the second part of this dictionary, on *Measuring Instruments and Laboratory Supply*.

—INTERNATIONAL INSTRUMENT CO., CAMBRIDGE, MASS.

**CENTRIFUGALS, NITRATING.** Of the firm of Selwig & Lange of Brunswick, Germany—purveyors to nearly all the European continental Governments, many foreign governments and private factories in the explosive line; recognized to be the most efficient and easiest running machines constructed heretofore. Made in different sizes up to a capacity of 20 kg.—44 lbs. cotton per charge; especially suited for powder and other explosive works. Also centrifugals adopted to meet any other requirements.

—J. W. SITTIG, NEW YORK.

**CHEMICAL CASTINGS.** See Castings, Chemical.

**CHEMICALS.** "Baker's Analyzed Chemicals." Every label shows an analysis, and our guarantee provides that the contents of each bottle will conform with that analysis. Price lists on request.

—J. T. BAKER CHEMICAL CO., PHILLIPSBURG, N. J.

**CHEMICALS.** Chemically pure ammonium hydrate, chemical salts, and reagents. Full particulars and prices on request.

—THE BAKER & ADAMSON CHEMICAL CO., EASTON, PA.

**CHEMICALS.** Most complete stock of tested purity, chemically pure, and pure chemicals, reagents and minerals for blowpipe work.

—EIMER & AMEND, NEW YORK.

**CHEMICALS.** Chemically pure ammonium hydrate, chemical salts, and reagents.

—GENERAL CHEMICAL CO., NEW YORK.

—GENERAL CHEMICAL CO. OF PENNA., PITTSBURGH, PA.

**CHEMICALS.** Chemically pure acids and aqua ammonia. Heavy chemicals for all purposes. Full particulars and prices on request.

—THE GRASSELLI CHEMICAL CO., CLEVELAND, OHIO., CHICAGO, ILL., AND NEW YORK.

**CHEMICALS.** Manufacturers', and electroplaters' chemicals.

—HANSON & VAN WINKLE CO., NEWARK, N. J.

**CHEMICALS.** For analytical, pharmaceutical, technical and manufacturing purposes.

—HENRY HEIL CHEMICAL CO., ST. LOUIS, MO.

**CHEMICALS.** "Let Merck make the 'Blank' Test for you. To that end, buy Merck's Blue Label Reagents."

—MERCK & CO., NEW YORK, ST. LOUIS, RAHWAY, N. J.

**CHEMICALS.** Commercial and chemically pure acids and ammonia, liquid carbonic acid gas, electrolyte.

—THE WESTERN CHEMICAL MFG. CO., DENVER, COLO.

#### **CHEMICALS.**

—ARNOLD, HOFFMAN & CO., PROVIDENCE, R. I.

—BAUSCH & LOMB OPTICAL CO., ROCHESTER, N. Y.

—GEORGE G. BLACKWELL, SONS & CO., LIVERPOOL, ENGLAND.

—CASTNER ELECTROLYTIC ALKALI CO., NIAGARA FALLS, N. Y.

—FUERST BROS. & CO., NEW YORK.

—HOOKER ELECTROCHEMICAL CO., NEW YORK.

—PENNSYLVANIA SALT MFG. CO., PHILADELPHIA, PA.

—ROBSSLER & HASSLACHER CHEMICAL CO., NEW YORK CITY.

—E. H. SARGENT & CO., CHICAGO, ILL.

—SCIENTIFIC MATERIALS CO., PITTSBURGH, PA.

—ARTHUR H. THOMAS CO., PHILADELPHIA, PA.

—ZUCKER & LEVETT & LOEB CO., NEW YORK.

**CHEMICAL MACHINERY.** For saving waste solutions.

—SWENSON EVAPORATOR CO., CHICAGO, ILL., (Formerly American Foundry & Machinery Co.)

**CHLORIDE OF LIME.** See Bleaching powder.

**CHLORIDE OF ZINC.** Solution, fused and granulated, for electrical and other purposes.

—THE GRASSELLI CHEMICAL CO., CLEVELAND, OHIO, CHICAGO, ILL. AND NEW YORK.

**CHLORIDE OF ZINC** in fused, granulated, and liquid form.

—SANDOVAL ZINC CO., EAST ST. LOUIS, ILL.

**CHLORINATION OF ORES.** Chlorine generated from brine in electrolytic cells. Castner-Kellner cell.

—CASTNER ELECTROLYTIC ALKALI CO., NIAGARA FALLS, N. Y.

**CHLORINATION OF ORES.** Townsend Cell.

—HOOKER ELECTROCHEMICAL CO., NEW YORK.

Another diaphragm cell.

—PENNSYLVANIA SALT MFG. CO., PHILADELPHIA, PA.

**CHLORINATION PLANTS.** For gold ores.

—ALLIS-CHALMERS CO., MILWAUKEE, WIS.

—COLORADO IRON WORKS CO., DENVER, COLO.

**CHLORINE** and chlorine products. Chlorine, generated by the Townsend cell, for the chlorination of ores.

—HOOKER ELECTROCHEMICAL CO., NEW YORK.

**CHLORINE** and chlorine products. (See also Cells—electrolytic.)

—ARNOLD, HOFFMAN & CO., PROVIDENCE, R. I.

—CASTNER ELECTROLYTIC ALKALI CO., NIAGARA FALLS, N. Y.

—PENNSYLVANIA SALT MFG. CO., PHILADELPHIA, PA.

**CHLORINE, LIQUID.** Used for bleaching, both in the bleaching of cottons, linens, and any vegetable fibres, as well as for paper stock. It may also be used economically and satisfactorily in laundries, being a thorough cleanser and powerful disinfectant. It is used largely in the chemical field; for the process of detinning; in the manufacture and treatment of platinum; as well as in the refining and smelting and separation of precious metals. It has also been used successfully for the purification of city water supply. It is shipped in steel cylinders or drums of approximately 100 lbs. each, under pressure. Its flow can be regulated simply by turning a valve. It does not deteriorate by standing, as being under pressure all air is excluded from contact with it until it is released by the turning of the valve.

—ELECTRO BLEACHING GAS CO., NEW YORK CITY.

**CHLORINE, LIQUID.**

—CASTNER ELECTROLYTIC ALKALI CO., NIAGARA FALLS, N. Y.

—GOLDSCHMIDT DETINNING CO., NEW YORK CITY.

**CHLORINE GENERATORS.** With sieve and ground—on cover made of acid-proof stoneware, in various capacities. Can also be furnished with water lute covers if desired.

—DIDIER-MARCH COMPANY, NEW YORK.

(Other stoneware makers see Stoneware.)

**CHLORINE GENERATORS—STONEWARE.** For production of chlorine by action of acid on common salt. Furnished in various sizes, complete with inner stoneware basket. Made from best chemical stoneware.

—CHARLES GRAHAM CHEMICAL POTTERY WORKS, BROOKLYN, N. Y.

**CHLORINE GENERATORS** of the well known form, fully able to withstand the pressure caused by the development of gas. They are also made with perforated false bottom acid and steam inlet pipes.

—J. W. SITTIG, NEW YORK.

**CHROME BRICK.** See Brick, Chrome.

**CHROME CEMENT.**

—HARBISON-WALKER REFRACTORIES CO., PITTSBURGH, PA.

**CHROME ORE.** See Ore, Chrome.

**CHROMIUM.** Metallic, free from carbon. Also chrome ore.

—GEO. G. BLACKWELL, SONS & CO., LTD., LIVERPOOL, ENGLAND.

**CHROMIUM, METALLIC.** Registered trade-mark "Thermit;" free from carbon, made by the aluminothermic method. As it contains no carbon and is of very high and uniform quality, it offers many advantages over ferro-chrome for alloying with steel and avoids the possibility of those unexpected fusions which frequently occur in using the latter, due to irregularities in the carbon content.

—GOLDSCHMIDT THERMIT CO., NEW YORK.

**CHROMIUM.** Fused, 98.99% pure, carbonless.

—ROESSLER & HASSLACHER CHEMICAL CO., NEW YORK.

**CLASSIFIERS.** Spitzkasten, cone sizers. The Akins mechanical classifier. For sizing crushed ore for concentration, separation of sand and slime for cyanidation and dewatering sands.

—COLORADO IRON WORKS CO., DENVER, COLO.

**CLASSIFIERS, HYDRAULIC.** Richards Vortex. Embodying many improvements and representing the latest design.

—ALLIS-CHALMERS CO., MILWAUKEE, WIS.

**CLASSIFIERS.** Hydraulic and Mechanical.

—COLORADO IRON WORKS CO., DENVER, COLO.

**CLAY.**

—ASHLAND FIRE BRICK CO., ASHLAND, KY.

**"CLIMAX" WIRE.** See Wire.

**COAL CAR DUMPING MACHINES.**

—THE BROWN HOISTING MACHINERY CO., CLEVELAND, OHIO.

**COAL HANDLING,** storage and rehandling machinery.

—THE BROWN HOISTING MACHINERY CO., CLEVELAND, OHIO.

**COAL JIGS.** Diescher Patent Coal Jig.

—SCAIFE FOUNDRY AND MACHINE CO., LTD., PITTSBURGH, PA.

**COAL WASHER.** Scaife patent automatic trough washer. Coal can be treated in either dust, slack, nut or small lumps and the slate, dirt, etc., removed, about 75 tons of raw coal being treated in 10 hours in a single trough. This requires from 1 to 2 horse-power. Anthracite culm and breeze-coke can be successfully treated. Having no screen, the washer is unaffected by considerable quantities of fire clay, slate, pieces of iron or other large and heavy materials. See also under "Washer."

—SCAIFE FOUNDRY AND MACHINE CO., LTD., PITTSBURGH, PA.

**COBALT.** Oxide.

—ROESSLER & HASSLACHER CHEMICAL CO., NEW YORK.

**COCKS.** Hard rubber.

—AMERICAN HARD RUBBER CO., NEW YORK.

**COCKS.** Of all descriptions, and sizes, both armored and plain, made of acid-proof stoneware.

—DIDIER-MARCH COMPANY, NEW YORK.

**COCKS, STONEWARE.** Absolutely non-corrosive, for use with nitric, muriatic and sulphuric acids, chlorinated brine, alkalies, etc., of any strength. Carefully tested under pressure before shipment and warranted tight. Adapted to lead pipe, cement, hose, metal flange or ground stoneware joints. Twelve sizes made in thirteen different styles.

—CHARLES GRAHAM CHEMICAL POTTERY WORKS, BROOKLYN, N. Y.

**COCKS—STONEWARE BLOCK COCKS.** These are for use in connection with acid pipe lines, for handling muriatic, nitric and sulphuric acids, chlorinated brine, and other corrosive liquids. Are intended for clamping between metal or other flanges without lead burning. The stoneware block cocks are provided on each side with grooves for one or two bolts, passing the cock, and entering flange on each side, a gasket usually being placed between. The strongest form of stoneware faucet made. (See illustration in *Metallurgical and Chemical Engineering* Feb. 1910 adv. page 28).

—CHARLES GRAHAM CHEMICAL POTTERY WORKS, BROOKLYN, N. Y.

**COCKS, STOP.** Of stoneware, of every description, made in sizes of  $\frac{1}{4}$ -8' bore. Plugs ground in absolutely tight and every cock is tested before delivery by means of a compressed air pump; also provided with iron armature or protected by iron or lead mantles.

—J. W. SITTIG, NEW YORK.

**COCKS, STONEWARE.** These faucets are made of specially prepared clay and are used where it is necessary for the faucet to be acid-proof. They are made in several different patterns, straightway—bibb—two-way—block and other styles, plain or threaded, as may be required, ranging from  $\frac{1}{2}$  to 3 inches in size.

—U. S. STONEWARE CO., AKRON, OHIO.

**COILS, COOLING.** Worms of stoneware of greatest possible durability, very suitable for all distillations; also for working under vacuum.

—J. W. SITTIG, NEW YORK.

(Other stoneware makers see Stoneware.)

**COILS, FUSED SILICA.** Up to  $1\frac{1}{4}$ " bore, and 50 ft. long, for volatile acids and pure products. Entirely free from breakage through temperature changes. (See also Quartz, fused in part II of this Dictionary.)

—THE THERMAL SYNDICATE LTD., NEW YORK.

**COILS, HEATING AND COOLING, COPPER.** Made from seamless copper, brass, iron, steel or block-tin tubing; can be furnished with flanged, brazed or welded joints. For some purposes welded joints are preferable, thus avoiding any electrolytic action and packing of flanges or hard or soft solder.

—BAEUERLE & MORRIS, PHILADELPHIA, PA.

**COILS, HEATING, COOLING.** Acid-proof stoneware cooling worms system Dr. Plath for condensing nitric and acetic acids, distilling organic acids, distilling by vacuum, heating or cooling acids, etc. All coils carried on an acid-proof stoneware frame.

—DIDIER-MARCH COMPANY, NEW YORK.

**COILS, STONEWARE.** For use in condensation of nitric acid, fine pharmaceutical products, etc. Made of best acid proof stoneware. Carried in stock and made to order in various sizes.

—CHARLES GRAHAM CHEMICAL POTTERY WORKS, BROOKLYN, N. Y.

**COLD GALVANIZING.** See Electrogalvanizing.

**COMPRESSORS AND EXHAUSTERS.** (See "Exhausters and Compressors.")

**CONCENTRATION.** Magnetic. See Magnetic Separators.

**CONCENTRATION MACHINERY.** Bartlett Simplex Concentrator, most improved design. A. & E. Slime Concentrator. Frue Vanners, Jigs. Also all other machinery for concentration of ores. See our catalog on Concentration Mills and Machinery, containing useful information and practical data regarding the treatment of ores by concentration.

—COLORADO IRON WORKS CO., DENVER, COLO.

**CONCENTRATION OF SULHPURIC ACID.** See Sulphuric Concentration, Kessler.

**CONCENTRATOR, HIGH. MANTIUS.** Carries the concentration of any liquor as delivered by the multiple effect, to a very high density under high vacuum with ordinary boiler pressure. Caustic soda is finished in it to upwards of 1.8 specific gravity (solidifies after discharging), saving half the fuel, labor, and equipment, necessary where the finishing is done in pots only. Capacity of present finishing equipment can thus be doubled. Materials of construction especially adapted to liquor concentrated. Heating surface so arranged that a rapid circulation is maintained up to the point of highest concentration. This apparatus is an improvement on the best German practice.

—ZAREMBA COMPANY, BUFFALO, N. Y.

**CONCENTRATOR. OVERSTROM.** A diagonal table, the table top being placed diagonal to the line of reciprocation. See description in *Electrochem. and Met. Ind.* Vol. III, p. 318 (1905).

—ALLIS-CHALMERS CO., MILWAUKEE, WIS.

**CONCENTRATOR.** Scaife patent automatic trough washer. For economically cleaning and concentrating gold, silver, lead, manganese and other ores, especially where ores of low grade are handled in large quantities. See also under "Washer."

—SCAIFE FOUNDRY AND MACHINE CO., LTD., PITTSBURGH, PA.

**CONDENSERS.** *A device for condensing of vapors and various materials. If desired, materials may be reclaimed in the condenser. They are of the surface and injection type. The surface condenser does not mix the cooling water with the vapors, the injection condenser does.*

Surface Condensers of any capacity for reclaiming material if desired. The amount of condensation may also be noted at any time. The reclaiming condensers may be emptied at any time without in any way affecting the operation of same. They may be used in connection with vacuum apparatus or under atmospheric pressure.

Injection Condensers of different capacities of the special improved type and adjustable water supplies, whereby the water may be reduced the exact amount necessary to condense the vapors. No waste of cooling water. May be used as barometric condenser, or attached direct to the wet vacuum pump. No attention re-



quired to operate them, self-cleaning and easily accessible to all parts.

—BUFFALO FOUNDRY & MACHINE CO., BUFFALO, N. Y.

#### **CONDENSERS JET BAROMETRIC.**

—ALLIS-CHALMERS CO., MILWAUKEE.

**CONDENSERS, SURFACE.** Our surface condensers are built of any size desired from copper, brass, steel, iron or block-tin depending on service required. Their design gives the highest efficiency possible for cooling water supplied and renders possible the cleaning of cooling surfaces if necessary.

—BABUERLE & MORRIS, PHILADELPHIA, PA.

**CONDENSERS, TUBULAR AND COIL.** In standard sizes and of various materials according to nature of condensate. Special attention to relation between length and diameter of tubes with result that highest efficiency is attained with minimum surface.

—WALTER E. LUMMUS, BOSTON, MASS.

**CONDENSERS, TUBULAR** surface, with brass, tin or copper tubes. The tubes are held in the tube sheets with screw ferrules permitting expansion. All sizes from 20 sq. ft. condensing surface upwards. Worm condensers, with either copper or block tin worms mounted in iron or wooden tanks.

—F. J. STOKES MACHINE COMPANY, PHILADELPHIA, PA.

**CONDENSER LEBLANC WESTINGHOUSE.** For steam turbines and steam engines. The Leblanc condenser is of the counter-flow jet type, equipped with a centrifugal discharge pipe and a special form of centrifugal air pump capable of handling large volumes of air and maintaining a vacuum corresponding to within two degrees of the temperature in the condenser.

—WESTINGHOUSE MACHINE COMPANY, PITTSBURGH, PA.

**CONDENSING APPARATUS, STONEWARE.** Chemical stoneware condensing apparatus of all sizes for any system. Receivers, coils, stand pipe, towers, etc., etc. Special patterns of any kind to customer's order. Ware guaranteed chemical proof.

—CHARLES GRAHAM CHEMICAL POTTERY WORKS, BROOKLYN, N. Y.

**CONDENSING APPARATUS.** Fused silica. Built up condensers from socket pipes; small towers, worms, etc. Made of pure fused silica. Entirely acid and heat proof.

—THE THERMAL SYNDICATE LTD., NEW YORK.

**CONDENSING JARS OR RECEIVERS OF STONEWARE.** Receivers in sizes ranging from 5 gals. to 150 gals. capacity. Can be made with pipe connections to suit purchaser. With or without faucet hole. Faucets can be supplied and ground in if required. Sockets are necessary in order to properly connect the pipes or bends.

Great care should be taken to thoroughly glaze those vessels in order to make them acid-proof.

—U. S. STONEWARE CO., AKRON, OHIO.

**CONDENSING PIPES OF STONEWARE.** Used in place of receivers.

—J. W. SITTIG, NEW YORK.

**CONDENSING PIPES, FUSED SILICA.** All sizes. (See also Quartz, Fused in Part II of this Dictionary.)

—THE THERMAL SYNDICATE LTD., NEW YORK.

**CONDENSING TOWERS—STONEWARE.** In all sizes. Made of best chemical stoneware guaranteed acid proof.

—CHARLES GRAHAM CHEMICAL POTTERY WORKS, BROOKLYN, N. Y.

**CONDENSING TOWERS OF STONEWARE** in all dimensions, most effective for rapid and perfect absorption, condensation and reaction. Well known Guttman towers with hollow balls; recognized as the most efficient filling material.

—J. W. SITTIG, NEW YORK.

**CONDENSING TOWERS OF STONEWARE.** These towers are in sections, and of various sizes. The cylinders range from 12 x 24 inches to 36 x 36 inches, as may be required. Five pieces usually constitute a tower although more can be added if desired. Perforated plate and distributing cover are necessary to complete tower. Great care should be taken in setting the tower in position so that the base will rest firmly and evenly on a solid foundation.

—U. S. STONEWARE CO., AKRON, OHIO.

**CONDENSING VESSELS OR RECEIVERS OF STONEWARE.** For nitric, muriatic acid, made in the usual pear shape or cylindrical form. New condensing or absorbing vessels of great efficiency for muriatic acid plants. Dense and thin material, highly resistant against temperature.

—J. W. SITTIG, NEW YORK.

**CONNECTING PIPES.** Of all kinds and sizes made of acid-proof stoneware.

—DIDIER-MARCH COMPANY, NEW YORK.

**CONNECTING PIPES, BRANCHES, ETC., OF STONEWARE.** Greatest variety of pipes, branches, bends, etc. Pipes can be made in any size and shape required.

—U. S. STONEWARE CO., AKRON, OHIO.

(Other stoneware makers see Stoneware.)

**CONNECTING PIPES, FUSED SILICA.** All sizes. (See also Quartz, Fused in Part II of this Dictionary.)

—THE THERMAL SYNDICATE LTD., NEW YORK.

**CONNECTORS, DOSSERT WIRE AND CABLE.** A method of making splices, tap-offs and terminal connections without using solder. These connectors can be used on both stranded and solid conductors. A skilled mechanic is not necessary; any ordinary workman can apply them in a few minutes. They have a wider area of contact than any other mechanical joint and are electrically and mechanically perfect. The carrying capacity of a Dossert joint when subjected to the action of a fusing current considerably exceeds that of the cable. Made of composition metal of high conductivity, strong and non-corrosive. Melting point 1210° C (2200° F). In making a joint the cable end, after being stripped of the insulation, is held in a compression sleeve fitting in a compression nut which is screwed up tightly on the nipple part of the connector or terminal, affording perfect contact all around the outside of the cable and having a minimum tensile strength of 40% of the tensile strength of the cable thus jointed. Especially useful where high temperatures prevail as in furnace leads, connecting cables to electrodes, electrolytic and electrometallurgical operations.  
—DOSSERT & CO., NEW YORK.

**CONTACTS.** For frequently interrupting electric circuits, especially where the current is of some magnitude, carbon contacts are essential to economy. Pure graphite has been proven superior to other forms of carbon, because of peculiar non-arcing properties, resistance to disintegration, one-fourth the ohmic resistance of amorphous carbon, infusibility and freedom from condensation of moisture resulting from variations in temperature. Easily machined and may be threaded into holder. Furnished either plain or copper-plated for soldering. Owing to low resistance can be used for both points of contact, thus avoiding the expensive platinum.  
—INTERNATIONAL ACHESON GRAPHITE COMPANY, NIAGARA FALLS, N. Y.

**CONTROLLERS.** Westinghouse automatic controllers. Electro-magnetic and electro-pneumatic switch units, controlled by master switch.  
—WESTINGHOUSE ELECTRIC & MFG. CO., PITTSBURGH, PA.

**CONVERTER BLOWER.** See Blowers.

**CONVERTERS.** Copper.  
—ALLIS-CHALMERS CO., MILWAUKEE, WIS.  
—COLORADO IRON WORKS CO., DENVER, COLO.

**CONVERTERS.** Westinghouse rotary converters. For electro-chemical and electrolytic purposes.  
—WESTINGHOUSE ELECTRIC & MFG. CO., PITTSBURGH, PA.

**CONVEYING MACHINERY.** For mines and metallurgical plants.  
—ALLIS-CHALMERS CO., MILWAUKEE, WIS.  
—COLORADO IRON WORKS CO., DENVER, COLO.

**CONVEYING MACHINERY.** Overhead mono-rail electric hoists for handling ores, coal, coke and other materials by grab buckets or otherwise. Their specialty is in the line of heavy and substantial machines for the most severe usage. Complete systems including tracks and supports when wanted.

—NORTHERN ENGINEERING WORKS, DETROIT, MICH.

**CONVEYING MACHINERY.** For coal, ore, etc. Of steel construction to secure special strength.

—SCAIFE FOUNDRY AND MACHINE CO., LTD., PITTSBURGH, PA.

**COOKERS, STEAM.** See Boilers.

**COOLERS, DISC.** Patented, made of acid-proof stoneware, put together in sections having an unusually high cooling capacity for the space occupied. Can be extended or reduced at any time.

—DIDIER-MARCH COMPANY, NEW YORK.

**COOLERS, DISC.** Of stoneware, substitute for cooling worms. Discs are exchangeable and easily replaced in case of breakage.

—J. W. SITTING, NEW YORK.

**COOLERS, LEAD.** Especially designed for use in sulphurous acid plants. The effect of absorbing the sulphurous acid gases is greatly facilitated by cooling the gases down as much as possible. This cooler consists of a number of lead pipes through which the gases pass. A tank surrounds the pipes and the water in the cooler passes up and down in counter current to the gases. In this way the coolest water comes in contact with the coolest gases, thus insuring a proper cooling effect. The cooler is so constructed that the pipes, which are entirely straight, can easily be cleaned by taking off the caps on top and bottom. Catalog SS-7.

—SCHUTTE & KOERTING CO., PHILADELPHIA, PA.

**COOLING COILS.** See Coils.

**COOLING ELEMENTS.** System Rabe, made of acid-proof stoneware for cooling and absorption purposes; these elements are placed between the tower sections and are very efficient. The cooling water enters and leaves these cooling elements through pipes on the side.

—DIDIER-MARCH COMPANY, NEW YORK.

**COPPER.** For manufacture of copper wire, castings for electrical and other purposes, sheet copper for roofing, etc. Alloys for journal bearings, brass castings, etc.

—C. W. LEAVITT & Co., NEW YORK.

**COPPER ELECTROLYSIS.** Copper is recovered from solutions containing iron salts by electrolysis with a moving anode in a diaphragm cell. The ferric salt produced at the same time is avail-

able as a solvent of copper from ores, etc. Write for details of tank construction, licenses, etc.

—ANSON G. BETTS, TROY, N. Y.

**COPPER SULPHATE.** Bluestone.

—GENERAL CHEMICAL CO., NEW YORK.

—GENERAL CHEMICAL CO. OF PENNA., PITTSBURGH, PA.

—PENNSYLVANIA SALT MFG. CO., PHILADELPHIA, PA.

**COPPERAS.** See Iron sulphate.

**COPPERS OR BOILING VESSELS.** With flat or curved bottom. Resist temperature exceedingly well, made of stone-ware or cast iron enameled ware.

—J. W. SITTIG, NEW YORK.

(Other stoneware makers see Stoneware.)

**CORE OVENS, MONARCH.** Adjusted with portable shelves, heated with oil, gas, coal or coke, automatic. Can pull out all shelves singly or in pairs; size 2' x 3' x 6' inside measurements; Asbestos lined; weight 700 lbs. Prompt shipments.

—MONARCH ENGINEERING & MFG. CO., BALTIMORE, MD.

**CORE OVENS.** For iron or brass foundries. Large sizes with car service or revolving type for day service.

—W. S. ROCKWELL COMPANY, NEW YORK.

**CORE OVENS** for baking small and large cores.

—ROCKWELL FURNACE COMPANY, NEW YORK.

**CORKS.** Rubber for acids.

—REVERE RUBBER CO., BOSTON, MASS.

**CORROSION-resisting iron.** See American ingot iron.

**CORUBIN,** a new abrasive material for making emery wheels, emery cloth and for any other purpose where a high class abrasive is needed. Corubin is a by-product formed in the production of pure metallic chromium by the Thermit process. It consists of aluminum oxide with traces of chromium oxide in it. Produced in three grades, coarse, medium and fine.

—GOLDSCHMIDT THERMIT CO., NEW YORK.

**COVERS.** Of acid-proof stoneware, in all manner of shapes and sizes, with and without outlets.

—DIDIER-MARCH COMPANY, NEW YORK.

(Other stoneware makers see Stoneware.)

**CRABS AND WINCHES.**

—THE BROWN HOISTING MACHINERY CO., CLEVELAND, OHIO.

**CRANES**, Electric, pneumatic and hand power traveling cranes. Cantilever and gantry cranes.

—THE BROWN HOISTING MACHINERY CO., CLEVELAND, OHIO.

**CRANES "Northern"**. Electric, pneumatic and hand power travelling cranes and jib cranes. Capacities range from 150 tons down to one ton, and spans and lifts are made to suit location. The Northern electric travelling crane in its standard type E construction has a trolley with gear trains collectively enclosed in split gear boxes, so designed that all bearings are capped and bronze bushed, and can use bath lubrication for gearing—making a silent protected and standard machine which can be equally well operated by direct-current or alternating-current motors. Also many other designs. Catalog No. 25.

—NORTHERN ENGINEERING WORKS, DETROIT, MICH.

### **CRANES.**

—SCAIFE FOUNDRY AND MACHINE CO., LTD., PITTSBURGH, PA.

**CREOSOTED WOOD**. Conduits, treated by Bethell process. We use nothing but dead oil of coal tar. Creosoted cross-arms, poles, paving blocks, railroad ties, protective casings for gas mains, etc.

—MICHIGAN PIPE CO., BAY CITY, MICH.

**CRITCHLOW NESTS, ATWOOD**. The Critchlow nest furnishes a means of grouping valves which yields a great saving in pipe, manifolds and space, where a number of similar small cylinders are to be operated from one pulpit; for instance, furnace doors, covers, etc. Used by most of the iron and steel works.

—PITTSBURGH VALVE, FOUNDRY & CONSTRUCTION CO., PITTSBURGH, PA.

**CRUCIBLES**. For high temperature work, crucibles machines from pure Acheson graphite rods or blocks which are subjected during manufacture to a temperature of 7500° F., are practically indispensable. In a reducing atmosphere they show highest efficiencies. Where the heat is generated electrically or by the Goldschmidt process, and purity of the treated material is essential, such crucibles should be used. Well suited for assaying and for melting the precious metals. Ease of making, inertness, efficiency, refractoriness, good heat conductivity and purity (99% Graphite) are favorable properties. Graphite tubes for the introduction or removal of gases can be threaded in.

—INTERNATIONAL ACHESON GRAPHITE COMPANY, NIAGARA FALLS, N. Y.

**CRUCIBLES OF CARBON**. Several sizes in stock, special sizes supplied on demand. Our crucibles are especially adapted to baking and melting various substances in small electric furnaces; they can, however, be used in gas furnaces, where the temperature is low, say not exceeding 500° C.

—NATIONAL CARBON CO., CLEVELAND, OHIO.

**CRUSHING** of fused silica. (See also Quartz, fused in part II of this Dictionary.)

—**THERMAL SYNDICATE, LTD.,** NEW YORK.

**CRUCIBLES.** Of Platinum. See platinum. Part II of Dictionary.

### **CRUSHING AND GRINDING. BALL MILLS.**

—**Ball Mills.** Also forged balls.

—**ALLIS-CHALMERS CO.,** MILWAUKEE, WIS.

—**Ball Mill, Abbé.** The Abbé Ball Mill is a revolving cylinder lined with steel steps, and contains a charge of steel balls. This type of machine is used extensively for grinding all kinds of materials from lump size down to 10, 20, 30, 40, 50, 60, 70 or 80 mesh, etc. It is the best machine for preparing material for concentrating purposes or for the tube mill. The mill as built by the Abbé Engineering Co. is very simple, compact and effective, requires no high foundations, as it is fed and also discharged at the center. The screening chamber is separate from the grinding compartment, and its screening capacity is ample to handle all the material ground. The usual type of ball mill generally is so constructed that from 25 to 40 per cent of finished material is returned to the grinding chamber, on account of insufficient screening capacity. The discharge of the Abbé Ball Mill is made in the form of a spiral, which delivers the finished product at the center and between these discharge spirals is the screen, also in the form of a spiral, which retains the coarse particles only and delivers them back into the mill again to be reground, by means of a conveyor located at the center, which revolves with the mill and requires no driving mechanism.

—**ABBE ENGINEERING CO.,** NEW YORK.

—**Ball Mills, Hard Porcelain or Gray Earthenware.** For hand or machine power. Very durable and answering the same purpose as the genuine porcelain mills, but not as expensive as the latter.

—**J. W. SITTIG,** NEW YORK.

—**Ball Mills, Krupp, Dry Grinding—Continuous Feed and Discharge.** A machine designed essentially for preliminary grinding ( $2\frac{1}{2}$ " down to 10 mesh—40 mesh) of all classes of refractory materials. It may, however, be adapted for considerably finer grinding. It consists of a cylindrical grinding drum made up of overlapping special high grade cast steel plates mounted between rolled steel side walls, which are lined with special cast steel plates. A charge of forged steel balls grind the material fed to the mill as it is revolved, the ground product being automatically separated so that all coarse material is at once returned to the mill for further reduction. This mill is fitted with an easily adjusted automatic feeder. It has a large capacity with low power and repairs.

—**THOMAS PROSSER & SON,** NEW YORK.

—**Ball Mill, Krupp. Wet Grinding—Continuous Feed and Discharge.** This mill (Heberle Patent) is a modified form of the dry grinding Ball Mill, but it is designed so as to obviate the large repair account that would be necessary if the standard form of dry grinding ball mill were operated on a wet basis. The general mounting is similar to the dry grinding mill but the grinding plates and screens are specially designed for this class of work.

—THOMAS PROSSER & SON, NEW YORK.

—**Ball Mill, Krupp. Enclosed—Dry and Wet Grinding.** The grinding barrels of these mills are of cylindrical or ellipsoidal form and furnished with balls, both made of proper material for different classes of work. These mills are made in all sizes from laboratory size up.

—THOMAS PROSSER & SON, NEW YORK.

**CRUSHING AND GRINDING BREAKERS.** Pig iron, etc.

—THE BROWN HOISTING MACHINERY CO., CLEVELAND, OHIO.

**CRUSHING AND GRINDING. CHILIAN MILLS.**

—ALLIS-CHALMERS CO., MILWAUKEE, WIS.

—COLORADO IRON WORKS CO., DENVER, COLO.

**CRUSHING AND GRINDING. CONICAL MILL. HARDINGE.**

A modification of the ordinary tube mill. Instead of a long cylinder, a short cylinder with conical extensions is used, so there are different peripheral speeds at different sections of the mill. There is a sizing of both the pebbles and the particles to be ground, and this results in a very low consumption of power and a very uniform product. Four methods of adjustment for fine grinding or coarse grinding, for sizing while grinding. Requires no spare parts for repairs. Of strong construction.

—HARDINGE CONICAL MILL CO., NEW YORK.

**CRUSHING AND GRINDING, CONICAL MILLS.** Abbé double conical mill. Wet or dry. By means of the "ideal" spiral feed the material is fed to the center of the mill at its largest diameter, where the largest pebbles are and the greatest grinding action takes place, and discharges at the apexes of both cones, thus giving a very high efficiency in proportion to the power consumed. The coarse material is subjected to the action of the large pebbles immediately upon entering the mill and the fine particles flow in both directions toward the ends, this makes the reduction swift and complete. Capacity according to size, from 50 to 250 tons per day.

—ABBE ENGINEERING CO., NEW YORK.

**CRUSHING AND GRINDING, CRUSHER MILLS, DAY'S LITTLE GIANT.** For crushing soft ores, clays, gums and dry colors. It is strong and simple in construction and has a capacity of one to three thousand pounds per hour.

—J. H. DAY CO., CINCINNATI, OHIO.



—**Crusher, Fine.** A machine built by the Abbé Engineering Company in five different sizes, from laboratory size with jaw opening  $1\frac{1}{2} \times 3\frac{3}{8}$ " to largest size having jaw opening of  $7 \times 18$ ". Used for crushing down to 4 mesh, all kinds of materials. The smaller sizes also reduce as fine as 8 mesh, and are therefore especially adapted to preparing material that is to be ground in small pebble mills.

—ABBE ENGINEERING CO., NEW YORK.

—**Crushers, Gyratory.**

—ALLIS-CHALMERS CO., MILWAUKEE, WIS.

—**Crushers, Gyratory.**

—MACKINTOSH, HEMPHILL & CO., PITTSBURGH, PA.

—**Crushers, Hammer.** The secret of fine grinding with a Hammer Crusher lies in keeping the hammers close to the cage. In "Pennsylvania" crushers, the hammer wear is compensated for by a slight turn of the hand wheel, which raises the cage close to the hammers. This adjustment is quick and may be made without shutting down, so that there is no excuse for the attendant failing to get the best results and uniform crushing at all times. This patent cage adjustment accomplishes in ten seconds what formerly required two to four hours. Compare this for practical simplicity with other makes of wear adjustment. All-steel frames, forged steel shafts "ball and socket" self-aligning bearings, steel wear liners, big man-holes, rolled-steel hammer discs, 6 and 8 rows of hammers, giving tremendous execution. Especially adapted for crushing cement rock, limestone, shale, coal, gypsum, clay, brickbats, chemicals, oyster shells, etc

—PENNSYLVANIA CRUSHER CO., PHILADELPHIA, PA.

—**Crushers, Jaw.**

—ALLIS-CHALMERS CO., MILWAUKEE, WIS.

—**Crushers, Jaw.** Blake type (for reduction to  $1\frac{1}{2}$ -inch size). Dodge type (for reduction to a much smaller size). Also sampling and laboratory crushers.

—COLORADO IRON WORKS CO., DENVER, COLO.

—**Crushers, Jaw.** Steel-plate roll jaw fine crushers. Of the same construction as the rock and ore breakers and smashers (see below Crushing and Grinding, Rock Breakers) with small motion of the jaws at the bottom, and a rocking jaw action, which gives the material a long, rolling crush, therefore a fine uniform product. Their range of output is from  $\frac{1}{2}$ " to 1", and they are built in sizes with jaw openings from  $2 \times 6$  to  $7 \times 72$ ".

—STURTEVANT MILL CO., BOSTON, MASS.

—**Crushers, Jaw Rock.** Powerfully built for brutal service and free from hot boxes, broken shafts and other common troubles. Simple in design, of few parts, and require no expert for repairs.

They are thoroughly reliable under trying conditions. The main frame is open-hearth steel, the shafts are high-grade steel forgings. Bearing made to template, are kept in stock by operator and easily replaceable; this saves lots of time compared with old-fashioned babbitting methods.

—PENNSYLVANIA CRUSHER CO., PHILADELPHIA, Pa.

—**Crushers, Rotary.** For chemicals, coal, limestone, phosphate, shale, gypsum, paint, ores, clay, lime, oyster shells, etc. On account of the slow speed and peculiar design of the crushing surfaces, the crushing action is gradual and very powerful, while the severe shocks found in crushing rolls are avoided and the crushed product is more uniform. Crushers have removable wear liners. Reduce to  $\frac{3}{8}$  in. and finer. Low in h.p. and repairs, and nearly free from flying dust. Built in capacities 2 to 200 tons per hour.

—PENNSYLVANIA CRUSHER CO., PHILADELPHIA, Pa.

—**Crushers, Rotary Fine.** For the fine reduction of soft and moderately hard materials, being largely used for phosphate, lime, gypsum, chemicals, paints, etc. They are of the open-door construction, and a range of output from cracked corn size to 1", and capacities from  $\frac{1}{2}$  to 35 tons, per hour. These are not gyratory machines and do not compete with them.

—STURTEVANT MILL CO., BOSTON, MASS.

**CRUSHING AND GRINDING: DISINTEGRATOR MILL. DAY'S LIGHTNING.** The grinding is done by hardened-steel beaters, riveted securely on a steel disc. The beaters revolve on the face or feeding side of the mill between corrugated rings. They catch the material and beat it against the corrugates until fine enough to pass between the disc and the face of the ring. It is then on the discharge side of the mill and all that is fine enough is driven out. That which is not fine enough to discharge is driven against the screens by the beaters until fine enough to pass through. The screens are made of square steel and present a grinding surface to the beaters.

—J. H. DAY CO., CINCINNATI, OHIO.

**Disintegrator Cage Mill,** built by the Abbé Engineering Co., which is used extensively in grinding glue, fertilizer materials, etc. The machine has a number of oppositely revolving cages which beat the material to pieces, and is built in several styles to suit special requirements.

—ABBE ENGINEERING CO., NEW YORK.

—**Disintegrators. Double cage.** For phosphate, bone, tangle, glue, etc.

—STURTEVANT MILL CO., BOSTON, MASS.

**CRUSHING AND GRINDING. DRUG MILL.** Small grinding mills, used extensively for reducing substances, such as crystals, dry colors, barks, roots, etc. The mill is adjustable and will deliver any

size product from powder of No. 60 fineness to granules the size of rice. The mill consists of only two parts, which can be instantly removed for cleansing. The gears are encased for protection. The capacity varies with the adjustment and weight of the material, delivering about 3 lbs. of granules a minute and  $\frac{1}{2}$  lb. of fine powder a minute. Floor space, 15 x 24 in. Weight, 100 lbs., pulleys, 10 in. x 2 in. Height, 4 ft., 6 in., speed 300 revolutions.

—F. J. STOKES MACHINE CO., PHILADELPHIA, PA.

**CRUSHING AND GRINDING, EUREKA MILLS.** Built in three sizes, Nos. 1, 2 and 3 for capacities of 30, 60 and 80 pounds. Composed of porcelain jars partly surrounded by wood and iron.

—ABBE ENGINEERING CO., NEW YORK.

**CRUSHING AND GRINDING, EXCELSIOR MILL KRUPP.** This mill belongs to the class of disc mills in which the material is ground to various degrees of fineness by passing the same between the discs. Is used largely in agricultural, chemical, metallurgical and spice and drug works for grinding materials used in the above classes of work. The mill consists of either one set (single mill) or two sets (double mill) of special iron discs either toothed or toothed and fluted, and designed in male and female form. One disc of each pair is stationary while the other revolves and the material having been fed in at the centre of the discs is cut up or ground between the teeth and is thrown out from between the discs by centrifugal force. The mill may be supplied with various attachments in the form of preliminary crushers, feeders, magnetic separators, dust hoods, etc., and is also arranged for either hand or power drive, and may be supplied for either wet or dry grinding.

—THOMAS PROSSER & SON, NEW YORK.

**CRUSHING AND GRINDING, FULLER-LEHIGH MILL.** For fine grinding and pulverizing. Grinds wet and grinds dry. Large output, economical, dustless. For grinding cements, ores, phosphate rock, lime rock, stone, sand, coal, and all kinds of refractory materials. The Fuller mill is made in two sizes, 33 in. and 42 in., these being the diameters of the dies used in the respective machines. The material to be reduced is fed to the mill from an overhead bin, by means of a feeder mounted on top of the mill and driven direct from the mill shaft. The grinding is done by means of four unattached steel balls, which are propelled by four equidistant horizontal arms or pushers radiating from a vertical central shaft. The material discharged by the feeder falls between the balls and the die and is reduced to a finished product in one operation. Above the die and the balls is a fan which is attached to the yoke propelling the balls. This fan has two rows of fan blades, one above the other. The lower set of fan blades lifts the finished product from the pulverizing zone into the chamber above the die, where it is held in suspension until it is floated out through a screen by means of the fanning action of the upper row of fan blades. The finished product is then discharged through a spout. The Fuller

mill is self-contained and requires no accessory equipment. Neither the 33-in. nor the 42-in. mill requires a greater floor space than 7-ft. square. The material delivered by the mill is a finished product and requires no subsequent screening.

—LEHIGH CAR, WHEEL & AXLE WORKS, CATASAUQUA, PA.

### **CRUSHING AND GRINDING. GRINDING MILLS.**

—Grinding mill. The vertical emery grinding mill for the fine grinding of soft and moderately hard materials. Largely used for gypsum, phosphate, paint, chemicals, etc. They are inexpensive, require no foundation, are complete and ready to run when shipped.

—STURTEVANT MILL CO., BOSTON, MASS.

—Grinding Mill. Horizontal emery grinding mills. Similar to vertical mills, but for harder materials, such as chrome, manganese, hard limestone, paints, etc.

—STURTEVANT MILL CO., BOSTON, MASS.

### **CRUSHING AND GRINDING. HARDINGE CONICAL MILL.**

See above under Crushing and Grinding, Conical Mill.

### **CRUSHING AND GRINDING. HUNTINGTON MILLS.**

—ALLIS-CHALMERS CO., MILWAUKEE, WIS.

**CRUSHING AND GRINDING, JAR MILL.** A, Abbé. Built with one and two jars, each jar capable of handling up to 15 pounds each at a charge.

—ABBE ENGINEERING CO., NEW YORK.

—Jar Mill. B, Abbé. Built with one jar encased in a galvanized iron cylinder. Grinds up to 25 pounds at once. The encased jar is surrounded by a cast iron ring set in a cast iron frame. This encased jar turns on a swivel to facilitate discharging the ground material.

—ABBE ENGINEERING CO., NEW YORK.

—Jar Mill. Improved porcelain. This type of jar mill, is considered most convenient to operate and requires less room than others. The jars are revolved by friction wheels and are lifted off for charging and emptying. The jars are manufactured from the best porcelain and are impervious to the action of even such substances as ink. They are useful for grinding and triturating all materials which corrode or react when ground in metallic mills, and are the only agency which will deliver a uniform product without bolting. The material is packed in the jars with flint or porcelain pebbles, the reduction being produced by the sliding and rolling of the pebbles upon each other as the jars rotate. Each jar has an average capacity of 25 lbs. They are interchangeable, and extra ones can be supplied. Floor space, 20 in. x 50 in., pulleys, 10 in. x 2½ in., speed, 50 revolutions.

—F. J. STOKES MACHINE CO., PHILADELPHIA, PA.

—**Jar Mills.** Single and double. These jars are encased in galvanized iron cylinders, similar to Jar Mill "B" and also work on a swivel. The single mill has one jar, the double mill two. Each jar being capable of grinding up to 15 pounds at a time.

—**ABBE ENGINEERING CO., NEW YORK.**

**CRUSHING AND GRINDING. MAX MILL.** Grinds by percussion. Is extensively used for grinding borax ore, coal, chemicals, sugar, etc., etc. It is built in three sizes for different capacities,

—**ABBE ENGINEERING CO., NEW YORK.**

**CRUSHING AND GRINDING. MILLS.** Lead and color mills made plain or water cooled and with French Buhr or Esopus stones. The method of adjustment is perfect. Fitted with an adjustable scraper. The steel spindle and heavy gears are cast from cut patterns. The mill is equipped with a 30-inch mixer which feeds the material to the stones, from whence it passes to a cooling pan. These mills can be furnished in any form desired; plain, with mixer or with mixer and cooling pan. Fitted with stones of 20, 24, 26 or 30 inches diameter.

—**J. H. DAY CO., CINCINNATI, OHIO.**

**CRUSHING AND GRINDING. PANS.** For regrinding pulp for cyanidation. A continuous feed and discharge pan, specially useful in such cases where small capacity with high efficiency is desired, and for such localities where the transportation of tube mills would be difficult.

—**COLORADO IRON WORKS CO., DENVER, COLO.**

—**Pans.** Wet and dry. One of the oldest types of reduction machines. Has long been recognized as an able design because of its simplicity, slow speed and reasonable repairs. Powerfully ribbed frame with full extension base counter shaft pedestals cast onto heavy cross beams—steel shafts—outboard pulley bearing—heavy rolls with removable tires—rolls run direct on wear plates, giving maximum crushing. These machines are unequaled where a heavy rugged design is required. Built in more than 30 sizes and styles, with both stationary and revolving bottoms.

—**PENNSYLVANIA CRUSHER COMPANY, PHILADELPHIA, PA.**

**CRUSHING AND GRINDING, PEBBLE MILL, ABBÉ.** Sometimes erroneously called a ball mill. The pebble mill grinds principally by friction, the effect being produced by the sliding, tumbling and rolling inside of the mill of a great number of flint pebbles or porcelain balls, which are mixed with the substance to be ground, and the movement being caused by revolving the mill at a regulated speed. The main part of the machine is either a plain porcelain jar fastened in a frame revolving in bearings, a porcelain jar encased and fastened in a frame that turns, a cast iron drum lined with porcelain brick, or a tank steel shell, having cast iron heads lined with porcelain. Pebble mills grind all kinds of hard and soft materials either

dry or thoroughly wet, such as chemicals, drugs, enamels, glazes ores, talc, feldspar, flint, etc., etc.

—ABBE ENGINEERING CO., NEW YORK.

—**Pebble Mills.** Built in eight different sizes by the Abbe Engineering Co., for handling from 120 to 4000 pounds at a charge. All equipped with their patented manhole having detachable flanges, which is an important feature of this type of mill.

—ABBE ENGINEERING CO., NEW YORK.

—**Pebble Mill.** Enclosed type. These mills consist of a shell made of steel plates, with cast-iron heads, and fitted with a manhole through which the material is fed and discharged, being lined with either iron or steel, porcelain or flint blocks, or with hickory wood, as may be best suited for the material to be pulverized.

—WEST PULVERIZING MACHINE CO., ASHEVILLE, N. Y.

**CRUSHING AND GRINDING, POT MILL.** This machine is used for both crushing and pulverizing, and is handy for grinding small quantity which could not be reduced economically in a large mill. The grinding is accomplished by heavy iron balls, which crush or pulverize the material, as they revolve. The pot is fitted with a tight cover, preventing the escape of dust and powder. The diameter of the pot is 24 in., capacity 30 lbs. Floor space 24 in. x 42 in. Weight 400 lbs., pulleys, 14 in., x 2½ in. Height 4 ft., speed, 50 revolutions.

—F. J. STOKES MACHINE CO., PHILADELPHIA, PA.

**CRUSHING AND GRINDING. RAYMOND MILL.** With air separation. Enables one to grind and separate at one continuous operation a powder much finer than can be produced by bolting. A clean grinding room with a large saving of labor and power. Large saving in raw material by finer grinding, economical separation, elimination of tailings and dust. Especially well adapted for alfalfa hay, asbestos and asbestos rock, asphalt rock, barytes, bauxite, blacking material, bone black, borax ore and borax, brick bats, carborundum, casein (dried milk), cast iron borings, clay, coal, coke, copper oxide, cryolite, enamel, feed materials of all kinds, fertilizers, phosphate rocks, fullers earth, glue, graphite, gypsum rock and plaster, hoofs and horn, insecticide powder, iron sulphate, kaolin, licorice root, caustic, lime, hydrated lime, limestone, magnesite, manganese ore, marble dust, mica, metallic paints, dry color paints, litharge, ochres, slate, umbers, peruvian bark, plaster of Paris, red lead, retarder, hard rubber, shells, silica, soap powders, soda, starch, talc, tankage, tobacco, trap rock and a great number of special materials difficult to classify. Used largely in cement plants for grinding coal and raw material and in beet sugar plants for grinding caustic lime. In hydrated lime manufacture for taking the hydrated lime, grinding and separating it and completing the process of hydration. In chemical plants largely used for grinding various materials to a fine powder. In the mills with air separation,

the air enters the mill through a series of tangential openings around the pulverizing chamber directly under the ring die and rollers, and that portion of the material which is reduced to the required fineness by the rollers passing over it once is instantly carried away by the air current, while that which is not fine enough drops down, is caught by the next plow following and carried between the succeeding roller and the ring die to receive like treatment. The mill has a very high capacity and produces a finished product of uniform fineness.

—RAYMOND BROS. IMPACT PULVERIZER CO., CHICAGO, ILL.

### **CRUSHING AND GRINDING. ROCK AND ORE BREAKERS.**

—ALLIS-CHALMERS CO., MILWAUKEE, WIS.

—COLORADO IRON WORKS CO., DENVER, COLO.

**CRUSHING AND GRINDING. ROCK BREAKERS.** For crushing rocks and ores to  $1\frac{1}{2}$ " size or coarser, special steel plate construction, which reduces their weight to one half that of ordinary breakers, special double cam and roller action, giving two crushing strokes to each revolution, therefore equal capacity at one-half the speed of others. Cast steel rocker arm, and swing jar; manganese-steel jaw plates, strong cast iron anvil front casting, securely rabbitted to the side plates, heavy iron cross beam at the rear, carrying bearings entirely independent of the frame, and which cannot get out of alignment.

—STURTEVANT MILL CO., BOSTON, MASS.

**CRUSHING AND GRINDING. ROLLER-MILL,** Raymond. See above Crushing and Grinding, Raymond mill with air separation.

### **CRUSHING AND GRINDING. ROLLS.**

—ALLIS-CHALMERS CO., MILWAUKEE, WIS.

—**Rolls.** Jacketed rolls for crushing coke, lump and small coal, ore, etc.

—SCAIFE FOUNDRY AND MACHINE CO., LTD., PITTSBURGH, PA.

—**Rolls.** Of the most improved design and construction, based on experience in actual operation. Improved standard wide-face rolls. Improved narrow-face high-speed rolls. Sectionalized crushing rolls. Humphrey rolls. Sampling rolls. Laboratory crushing rolls.

—COLORADO IRON WORKS CO., DENVER, COLO.

—**Rolls.** High-speed rolls with armorplate tyres, grinding device to true rolls while running, and self-oiling journals. Twice the work of stamps with half the power.

—MARCUS RUTHENBURG, LONDON.

—**Rolls. Balanced Crushing Rolls.** Having springs back of all bearings, thus securing perfect balance. All reciprocating move-

ments are equal and opposite at the same time, thus quartering the ordinary crushing shocks. Special car box bearings, universal adjustment, that is, adjustment for varying products and lateral adjustments. No shims; bearings which cannot get out of alignment; automatic double swing feeder. These Rolls are adapted for either roughing or finishing, on wet or dry material.

—STURTEVANT MILL CO., BOSTON, MASS.

—**Rolls. Plain Balanced Rolls.** Less expensive machines than the regular balanced rolls, the weights reduced about one-half, owing to the steel tie bar construction, but have the same balanced principle. Springs back of all four bearings, automatic single throw feeder for roughing or finishing work, on wet or dry material.

—STURTEVANT MILL CO., BOSTON, MASS.

—**Rolls. Day's Three Roll Pigment Mill.** For printing ink, paints, chocolate, etc. Made with chilled iron rolls either plain or hollow for water cooling or steam heating. The bearings for rolls are fitted in heavy, planed housings and provided with phosphor-bronze bushings of peculiar construction, forming an oil-flooded bearing thus preventing the journals from heating. The scraper apron is adjustable and made to follow the roll when moved in or out. When specially ordered a feed hopper can be attached to the initial roll. Made with rolls 9 x 34 inches and 12 x 32 inches.

—J. H. DAY CO., CINCINNATI, OHIO.

—**Rolls. Ring-roll Grinding Mill.** For all hard or moderately hard, dry materials, having a revolving ring upon which material is fed, holding it thereon by centrifugal force until crushed off of both sides by three rolls, pressed against this layer of material with from 40,000 to 60,000 pounds pressure. It has the open-door construction for complete accessibility, automatic feeder, only four wearing parts of importance. A ring and three rolls make an old mill new. It has a range of output of from 8 to 100 mesh and finer, and the capacity is from one to fifteen tons per hour. It is built in two sizes, and used for grinding ore, cement clinker, limestone, granite, trap and similar materials.

—STURTEVANT MILL CO., BOSTON, MASS.

—**Rolls. Single-roll Crusher.** A single roll revolving close to a quickly adjustable breaker plate, in place of two rolls commonly used. Roll is heavily back geared and rigidly held in its bearings to prevent spreading when feeding large lumps. This design is smoother running than the double roll. Bed frame in one piece and very rigid. Different designs of roll teeth are made. Sometimes driven by motor. Moderate h.p., slow speed, low repairs. Adapted for coarse and moderately fine crushing. For coarse crushing (down to 1") of coal, coke, iron ore, limestone, phosphate rock, gypsum, flint clay, chemicals, etc

—PENNSYLVANIA CRUSHER CO., PHILADELPHIA.



**CRUSHING AND GRINDING. SAMPLE. MILL** Self-contained, liberally proportioned, accessible, easily cleaned for sampling plants, mills, laboratories.

—ALLIS-CHALMERS Co., MILWAUKEE, WIS.

—**Sample Mill.** A small porcelain jar mill suitable for handling from  $\frac{1}{4}$  oz. to  $1\frac{1}{2}$  lbs. at a time. Also built with two jars, five jars, etc.

—ABBE ENGINEERING Co., NEW YORK.

**CRUSHING AND GRINDING. SMASHERS.** Steel-plate rock and ore smashers. The same construction as our steel-plate rock and ore breakers (see above Crushing and Grinding Rock Breakers), the jaw action, however, being reversed, that is, the larger motion being at the top and the smaller at the bottom. The jaw openings of these machines are  $5 \times 10''$  to  $7 \times 72''$ . For intermediate crushing having a range of output of from  $2''$  to  $1''$ .

—STURTEVANT MILL Co., BOSTON, MASS.

#### **CRUSHING AND GRINDING. STAMP MILLS.**

—ALLIS-CHALMERS Co., MILWAUKEE, WIS.

—**Stamp Mills.** In addition to the building of machinery, a large branch of the business of the company consists in designing and erecting complete milling and smelting plants. Catalog No. 6-C on Stamp Milling Machinery.

—COLORADO IRON WORKS Co., DENVER, COLO.

**CRUSHING AND GRINDING: TUBE MILL, ABBÉ.** The Abbé tube mill works on the same principle as a pebble mill, but it is a machine used for larger capacities when a continuous feed and discharge is necessary. The Abbé Engineering Company equip all their tube mills with their patented "Ideal" spiral feed and discharge, which does away with a special drive, being attached direct to the machine, requires no stuffing boxes, enables feeding pebbles into the mill and can also be used to discharge them. This arrangement also avoids all conveyors and enables the loading of the tube mill with pebbles over the center, which increases the capacity of the Abbé tube mill and also decreases the horse power required to drive it, as the loading of the pebbles over the center partially balances the machine. In wet grinding it also enables the loading of the Abbé tube mill with material two-thirds or three-fourths full, practically doubling the grinding capacity and decreasing the power required to operate it by about 40 per cent. Tube mills are generally supported by two end bearings called the trunnion style of mill, but the Abbé Engineering Co. in addition also build a tire style of mill which is supported on four rollers on which two tires revolve, which surround the shell of the mill. This type of machine has the advantage of being more readily accessible, requiring no manhole in the shell, and can also be operated with

approximately 25% less power than the trunnion styles of mills of the same size and capacity.

—ABBE ENGINEERING CO., NEW YORK.

—**Tube Mills.** Of heavy, rigid construction, especially for fine grinding in the operation of the cyanide process.

—COLORADO IRON WORKS CO., DENVER, COLO.

—**Tube Mill, Gates.** For either wet or dry grinding. In all sizes.

—ALLIS-CHALMERS CO., MILWAUKEE, WIS.

—**Tube Mill, Krupp. Dry Grinding—Continuous Feed and Discharge.** This mill is specially designed with the object in view of minimizing the amount of attention required for operating as well as for reducing the renewals required. It is a fine grinding or pulverizing machine, and in many instances follows the ball mill as a finisher. The feeder is a sight feeder and is capable of being adjusted without stopping the mill or any portion of the feeding mechanism. The discharge device, which is of the central discharge type, is designed so that it automatically keeps itself free thus allowing a maximum discharge, and all dust is avoided by the use of this type of discharge. All the parts of the mill itself as well as the driving gearing are exceptionally heavy as the service to be performed requires exceedingly substantial construction. When this mill is lined with steel and supplied with steel balls, it is known as a Ball-Tube Mill.

—THOMAS PROSSER & SON, NEW YORK.

—**Tube Mill, Krupp. Wet Grinding—Continuous Feed and Discharge.** This mill is similar to the dry grinding mill in general construction but the feed and discharge are designed so as to permit of the handling of materials carrying a large percentage of water.

—THOMAS PROSSER & SON, NEW YORK.

—**Tube Mill, Krupp. Enclosed—Dry and Wet Grinding.** A closed cylinder or shell with manhole and proper lining, mounted on heavy trunnion bearings and specially constructed to meet the various requirements of this line of work.

—THOMAS PROSSER & SON, NEW YORK.

—**Tube Mill. Dry Grinding—Continuous Feed and Discharge.** This mill which is of the trunnion type is of the standard construction, but the driving mechanism has received especial attention. It is used for fine grinding and finishing the rough material. It is fed automatically and the feed is designed so that the quantity of material may be varied to suit the requirements, while the mill is running. The discharge, which is fed through the center of the rear hub, is entirely automatic and insures a maximum of standard finished material, the coarser material being returned to the mill

to be finished to the required fineness. This Mill has a large capacity, and is operated with a minimum of power and repairs.

—WEST PULVERIZING MACHINE CO., ASHEVILLE, N. C.

—**Tube Mill. Wet Grinding—Continuous Feed and Discharge.** This mill is identical with the dry grinding machines, but is designed to handle wet material containing a large percentage of water, or material in a liquid state.

—WEST PULVERIZING MACHINE CO., ASHEVILLE, N. C.

—**Tube Mill.** See also "Crushing and Grinding. Conical Mill."

**CRUSHING AND GRINDING.** See also "Filter. Slimes."

—THE MOORE FILTER CO., NEW YORK.

**CRYOLITE.** See Kryolite.

**CRYSTALLIZING PANS AND VESSELS** of fused silica. (See also Quartz, fused in part II of this Dictionary.)

—THERMAL SYNDICATE LTD., NEW YORK.

**CRYSTALLIZING PANS OR DISHES.** Glazed or unglazed inside with flat or round bottoms of stone-ware or cast iron enameled ware.

—J. W. SITTIG, NEW YORK.

(Other stoneware makers see Stoneware.)

**CRYSTALLIZING VESSELS.** Of acid-proof stoneware in various sizes and shapes.

—DIDIER-MARCH COMPANY, NEW YORK.

(Other stoneware makers see Stoneware.)

**CUPELS.** Hoskins' "Brownite" cupels have absorbing qualities—superior to those of bone ash, are uniform in composition, and practically non-breakable. They are made in five standard sizes; 1 in., 1½ in., 1¾ in., 1½ in., and 2 in. in diameter. Are packed in boxes of 100 and carry any distance in perfect condition.

—HOSKINS MANUFACTURING COMPANY, DETROIT.

**CUPEL FURNACES.** See Furnaces Cupel.

**CUPOLA BLOWER.** See Blowers, Piqua Positive.

**CUPOLA LININGS.** See Linings.

**CUPOLA, NEWTEN.** A modern cupola for melting iron with a differential adjustable tuyere system and an all-steel air chamber. The areas of tuyeres, blast pipe, and air chamber are designed in the exactly right proportion to the size of furnaces and blower. The main tuyeres are of the expanded type, of ample area to insure the

transmission of sufficient air to the furnace. The increase in the area of the greater portion of the tuyeres as they approach the fuel gives a blast of large volume and of moderate pressure nearest the iron, and the wide tuyeres afford nearly a continuous blast opening around the furnace walls. By these means ample blast area is assured even if a portion of the tuyeres area is stopped by pieces of coke or other obstructions. Combined with this is the important feature of a differential blast. The main tuyeres each have two supporting ribs, placed at an angle and giving a slightly contracted effect to a small portion of the blast, thus tending to force this portion toward the proportionately smaller area of the center of the furnace, while the expanded blast supplies the larger area nearer the lining, resulting in a differential blast covering the entire area of the furnace. The result is a quick melting heat, and fluid metal with a high fuel economy. The lower tuyeres are adjustable vertically, through several inches, to suit either a deep or a shallow bed of fuel. This adapts the furnace to either coke or coal, or to any change in the inside diameter of the furnace, to suit different classes of work. Catalog No. 51.

—NORTHERN ENGINEERING WORKS, DETROIT, MICH.

**CUPRO-VANADIUM.** Used for alloying with copper, brass, and bronze. Increases strength, makes the metal more homogeneous and greatly improves wearing qualities.

—AMERICAN VANADIUM CO., PITTSBURGH, PA.

**CUTTER, ROTARY.** A machine composed of a cylinder having attached to it a number of knives revolving in a circular case, against a number of stationary knives set at intervals inside the case. This machine is especially adapted to cutting up all kinds of roots, herbs, spices, tobacco stems, wood pulp, hard fibre, drugs, etc.

—ABBE ENGINEERING CO., NEW YORK.

**CUTTING, OXY-ACETYLENE.** Steel and iron (except cast iron) may be cut by the modified oxy-acetylene process. The ordinary oxy-acetylene flame (see Welding, Oxy-acetylene) is used to heat the surface of the metal, whereupon a pure jet of oxygen is turned onto the heated metal, disintegrating it immediately by autogenous combustion. The cutting blow-pipe differs, therefore, from the welding blow-pipe by an additional attachment, furnishing an independent supply of oxygen. By this process bridges, boilers, arches, etc., can be wrecked. Also dies cut out and repaired. Defective parts in steam boilers, containers, etc., can be cut out and replaced. The metal is not changed or injured in the operation.

—AMERICAN OXYGEN CO., PHILADELPHIA, PA.

—DAVIS-BOURNONVILLE CO., NEW YORK.

—INDUSTRIAL OXYGEN CO., NEW YORK.

#### **CYANIDES.**

—FUERST BROS. & CO., NEW YORK.

**CYANIDES.** 98% 99% (39½% cyanogen). 120% 130% (48-52% cyanogen).

—ROESSLER AND HASSLACHER CHEMICAL CO.

**CYANIDE EQUIPMENT.**

—ALLIS-CHALMERS CO., MILWAUKEE, WIS.

**CYANIDE EQUIPMENT.** A complete line of machinery, and appliances for the treatment of ores by the cyanide process. Design and erection of complete cyanide plants embodying the latest advancements in the application of the process.

—COLORADO IRON WORKS CO., DENVER, COLO.

**CYANIDE PLANTS** made to order.

—PACIFIC TANK & PIPE CO., SAN FRANCISCO, CAL., PORTLAND, ORE., LOS ANGELES, CAL.

**CYANIDE PROCESS.** The Clancy improvements controlled by this company reduce the loss of cyanide more than 50%; refractory ores, not amenable to cyanide treatment, unless roasted, are with the Clancy "additions" treated raw.

—THE MOORE FILTER CO., NEW YORK.

**CYANIDE PROCESS.** Amalgamating riffles for gold and silver ores. They amalgamate more gold and silver than the flat plates as all of the fine or flour gold is brought to the amalgamated surface and cannot escape; also the tarnished or rusty gold that is lost over flat plates is recovered in the riffles.

—LUCIUS S. PIERCE, DENVER, COLO.

**CYLINDERS, SEAMLESS STEEL, COLD DRAWN.** See Tanks, seamless steel.

**DAMPERS** for gas pipe lines; air-tight revolving dampers capable of very exact adjustment; also ordinary plate dampers.

—DIDIER-MARCH CO., NEW YORK.

**DAY MILLS.** See Crushing and Grinding.

**DECANTING POTS.** Of acid-proof stoneware, in various sizes and shapes, with and without handles.

—DIDIER-MARCH COMPANY, NEW YORK.

**DECANTING POTS OF STONEWARE.** In different styles.

—J. W. SITTIG, NEW YORK.

**DECANTING POTS.** Stoneware made with as many discharge holes and of whatever size required, running diagonally on side of pot from the bottom to the top, or less, as required. In sizes ranging from 2 to 200 gals. capacity. Stoneware faucet ground into each

discharge tube can be supplied if desired. Glaze with our superior acid-proof glazing to insure best results.

—U. S. STONEWARE Co., AKRON, OHIO.

(Other stoneware makers see Stoneware.)

**DENITRATING PLANTS**, system, Evers. Yield water-white sulphuric acid 60° Bé and nitric acid of 36 to 40° Bé. For denitrating mixed acids from manufacture of nitroglycerine, nitrotoluol, etc.

—DIDIER-MARCH Co., NEW YORK.

(Other stoneware makers see Stoneware.)

**DETINNING**. Separating of tin and solder from "tin scrap" and other tin-bearing materials and producing merchantable steel scrap, tin products and solder. In the chlorine detinning process the products are steel scrap and tin tetrachloride.

—GOLDSCHMIDT DETINNING Co., NEW YORK CITY.

**DIAMONDS**. For technical and industrial purposes (Carbons and Borts).

—ATKINS, KROLL & Co., SAN FRANCISCO, CAL.

**DIAPHRAGMS**. Successful diaphragms for acid solutions are made of asbestos, with the fibres cemented together by sulphur. Such diaphragms do not soften when wet, but retain the stiffness of asbestos sheets and mill board.

—ANSON G. BETTS, TROY, N. Y.

**DIAPHRAGMS**. Rubber, for pumps, vacuum brakes, steam regulators, for use in paper mills.

—REVERE RUBBER Co., BOSTON, MASS.

**DIFFUSION BATTERIES**. Leaching cells, digesters, for producing a partially concentrated extract or solution from any material being handled in quantity, in which the solvent is water. Now installed for the lixiviation of "black ash", extraction by diffusion of sugar from beets, etc. We build single and double line as well as circular batteries of any size and have sold a great many equipments. Shells of steel or cast iron and designed to meet the requirements of each installation. Drop or swing bottom or swinging side door discharge operated by hand, or, in large equipments, with hydraulic closing arrangement. Intermediate heaters if desired.

—SWENSON EVAPORATOR Co., CHICAGO, ILL. (Formerly American Foundry & Machinery Co.)

**DIFFUSION BATTERIES**. See also Cells, Leaching.

**DIGESTER AND COOKER**. Automatic continuous: of the direct steam type, operating continuously. Inside of a cylindrical steel shell is a specially constructed screw conveyor, made up of cut flights, and by its rotation cuts up and thoroughly agitates the material and carries it forward. Steam is admitted through per-

forations in the hollow shaft of conveyor. Suitable for handling offal from fishing plants, etc.

—AMERICAN PROCESS COMPANY, NEW YORK.

**DIGESTERS.** See also Diffusion batteries, and Cells, Leaching.

**DIPPING BASKETS OF STONEWARE.** For platers, galvanizers, etc. These baskets are made in size from 6 x 6 inches to 12 x 12 inches, or larger if required. Have perforations from  $\frac{1}{8}$  to  $\frac{1}{4}$  inch. Heavily glazed with our specially prepared acid-proof glazing, with a high strong handle.

—U. S. STONEWARE CO., AKRON, OHIO.

(Other stoneware makers see Stoneware.)

**DISCS.** Discs, bushings, washers and other small carbon articles formerly made in molds can frequently be far more economically produced by machining from solid Acheson-Graphite rods. High electrical conductivity, purity (99%), smoothness, lubricating properties, resistance to oxidation and disintegration, and non-arcing properties are important considerations in this connection.

—INTERNATIONAL ACHESON GRAPHITE COMPANY, NIAGARA FALLS, N. Y.

**DISSOLVER, RAPID.** Consists principally of a bowl with a stirring wheel at the bottom. The purpose of this machine is to dissolve such substances as chloride of lime, all kinds of salts and chemicals, such as, sulphate of alumina, kaolin, china clay, sulphate of baryta, etc. Owing to the exceedingly rapid action of the stirring wheel the machine has an enormous output with minimum consumption of power, the largest size for instance taking only about 3 h.p. The machine is made in sizes of 125 to 1250 gallons. The discharge valve is located at the lowest part of the bowl, and the inside of the machine is easily accessible for cleaning, etc. The machine can be arranged so that it can be driven from top or from below to suit local conditions.

—WERNER & PFLEIDERER, SAGINAW, MICH.

**DISTILLATION ENGINEERING.** Pertains to the design and installation of chemical plants in which processes of distillation are wholly or in part employed. Hardwood distillation with the manufacture of methyl alcohol, acetone, acetate, charcoal and pine wood distillation to produce turpentine, pine oil, rosin, tar, etc., serve to illustrate the nature of the field. Innumerable refining processes such as the manufacture of formaldehyde, acetic acid, ether, chloroform, alcohols, petroleum, are further examples of its scope. Improvement of old distillation processes, founding of new ones; betterment of yields and quality of products; installation of modern apparatus; equipment of labor saving plants—all with one end in view—reduction of cost and increase of earnings.

—WALTER E. LUMMUS, BOSTON, MASS.

**DISTILLATION, WOOD.** For hard or pine wood with complete equipment of retorts or ovens, stills, condensers, settling, neutralizing and storage tanks. Old types on demand; improved forms recommended and covered by real guarantees.

—WALTER E. LUMMUS, BOSTON, MASS.

**DISTILLING MACHINERY AND APPARATUS.** For the manufacture of alcohol, rum and whiskey, recovery of solvents, etc., and for various chemical industries, such as a manufacture and refining of wood alcohol, acetic acid, acetone, chloroform, ether, etc. Where size permits, continuous stills are made which operate more economically than periodic stills and yield larger amounts of better products. The special apparatus of this firm in the distilling line includes patent continuous rum or whiskey still, special still for acetic acid, continuous beer still, silver and lead line stills of copper and iron manufactured by patented process, etc. Besides the distilling apparatus proper which are designed to suit each particular case, plants complete with all auxiliary apparatus are planned and furnished.

—E. B. BADGER & SONS CO., BOSTON, MASS.

**DISTILLING MACHINES.** Automatic and continuous in operation. Products turned out simultaneously and in finished condition. No intermediate fractions to be worked over. Unit system of construction makes it possible to meet conditions exactly. Sizes to handle from 500 to 1000 gals. per 24 hour day. Specially adapted to wood alcohol, wood turpentine, acetic acid, petroleum, separation of recovered solvents, etc.

—WALTER E. LUMMUS, BOSTON, MASS.

**DISTILLING.** See also Stills.

**DOLOMITE.** For furnace linings.

—E. J. LAVINO & CO., PHILADELPHIA, PA.

**DOSSERT CONNECTORS.** See Connectors.

**DREDGES.** Gold dredges. Dipper dredges. Hydraulic dredges.

—ALLIS-CHALMERS CO., MILWAUKEE, WIS.

**DREDGES.** For gold and silver ores. See Amalgamating riffles.

**DRYER, DIRECT STEAM HEATED AIR.** This dryer is similar in operation to the Direct Heat Rotary Dryer below described, except that instead of furnace, heater and fan are used. The air is heated by being blown over steam coils of the heater. The material passes either with or against the blast of air according to the material being handled. This dryer is suitable for handling material that cannot come in direct contact with the gases of combustion or that must be dried at a low temperature.

—AMERICAN PROCESS CO., NEW YORK.



**DRYERS, DRUM.** For drying under vacuum or at atmospheric pressure; arranged for low or high temperatures. The material to be dried is applied in an even layer of adjustable thickness. As the drum does not dip into the liquor there is no foaming in the dryer. The dry product is discharged continuously without interrupting the drying process or breaking the vacuum. Our design is very compact, calling for small floor space, with weight reduced to the minimum consistent with proper strength. The dryer is so built that its capacity can be readily increased.

—ZAREMEA COMPANY, BUFFALO, N. Y.

**DRYERS. ROTARY.**

—ALLIS-CHALMERS CO., MILWAUKEE, WIS.

—COLORADO IRON WORKS CO., DENVER, COLO.

**DRYER ROTARY.** Direct heat. The wet material and the furnace gases enter the shell at the higher end. The wet material falls to the bottom of the dryer, is caught by a shelf, elevated to almost the highest point during rotation, and then showered through the gases. This operation is repeated until the material in a dry condition is discharged from the lower end of the cylinder. This material is moved towards the discharge by the slope of the cylinder and by the draft. The material and furnace gases travel in the same direction, so that gases of the highest temperature are in contact with the wettest material. This dryer is suitable for handling all refuse material, such as lime refuse, carbonate and sulphate of lime, offal from packing houses and fish canning plants, etc.

—AMERICAN PROCESS COMPANY, NEW YORK.

**DRYER, ROTARY.** Direct steam, hot air and gas-heated rotary dryers for such materials as are not sensitive to heat (such as sensitive must be dried in a vacuum dryer.) The drying is rapid and continuous. These dryers are made to revolve or to not revolve, and are made to suit the conditions at the factory. The non-revolving dryers are placed horizontally, the revolving dryers on a slight angle. Both are rapid in their work and are adapted to such materials as fertilizers, packing house and other by-products, and various granular substances.

—BUFFALO FOUNDRY & MACHINE CO., BUFFALO, N. Y.

**DRYERS. SIX TYPES.**

**Class "A."** For materials which may be heated to a high temperature and are not injured by furnace gases. A rotating machine consisting of two concentric cylinders fastened rigidly together at centre and at other points with swinging braces allowing free expansion. Heat from an independent furnace passes through inside cylinder, back between the two cylinders and out through an exhaust fan. Material fed in between the two cylinders at furnace end is lifted by steel flights on inside of outer shell and dropped on heated inner shell; by rotation of machine the material is again dropped to outer shell which process is continued until on account

of inclination of machine it is finally delivered dried from rear end. Machine is supported by steel tires resting on eight chilled and ground bearing wheels supported on cast bases and is driven by gear and pinion. This machine develops 75% or more thermal efficiency and is built for a capacity as high as 6000 lbs. of water evaporation per hour.

—RUGGLES-COLES ENGINEERING CO., NEW YORK.

**Class "B."** For materials which may be heated to a high temperature but cannot be allowed in contact with furnace gases. A machine consisting of two concentric cylinders similar in appearance and construction to the "A" dryers but the products of combustion after passing through the inner cylinder are taken back through tubes arranged around the inside of outer shell and out through exhaust fan, so they do not come into contact with material being dried. These dryers will give 50% thermal efficiency and are built for a capacity as high as 4000 lbs. of water evaporation per hour.

—RUGGLES-COLES ENGINEERING CO., NEW YORK.

**Class "C."** For material which can neither be heated to a high temperature nor come into contact with furnace gases. A machine consisting of a rotating cylinder with steel tires chilled bearing wheels and cast bases similar to "A" dryers, but instead of furnace and inner cylinder there is riveted at one end a steam head connected to which are steam pipes extending to other end. These are so arranged as to drain into steam head and water is automatically removed as fast as formed. This machine gives a thermal efficiency of 72% from steam used. As however steam can only be produced with an efficiency of about 60% the total thermal efficiency of this dryer from coal is about 43%. If exhaust steam is used which would otherwise be wasted the cost of drying is only the cost of maintenance. These dryers are built for a capacity as high as 1000 lbs. evaporation per hour.

—RUGGLES-COLES ENGINEERING CO., NEW YORK.

**Class "D."** For sticky materials which cannot be heated to a high temperature nor allowed in contact with furnace gases. A machine consisting of stationary steam-jacketed semi-circular troughs, with straight sides and covers. Through the centre is a revolving square shaft with paddles bolted on, which paddles keep the material from sticking to the shell and feed it through the dryer. These dryers will give a thermal efficiency of 60% from steam used and are built for a capacity as high as 500 lbs. of water evaporation per hour.

—RUGGLES-COLES ENGINEERING CO., NEW YORK.

**Class "E."** For sticky materials which may be raised to a high temperature and which are not injured by furnace gases. A machine consisting of stationary bricked-in semi-circular cast iron trough with straight sides and cover. Through the centre is a revolving square shaft with paddles bolted on, which keep the material from adhering to shell and feed it through the machine. This

dryer has an exterior furnace and products of combustion pass under shell and back through drying material. This dryer has a thermal efficiency of 50% and is built for a capacity as high as 2000 lbs. of water evaporation per hour.

—RUGGLES-COLES ENGINEERING CO., NEW YORK.

**Class "F."** For materials the same as for "A" dryers but in which small capacity is required or economy of operation is not desired. A machine consisting of single rotating shell with lifting flights material being fed through by inclination of machine. A furnace is placed at either end as best suited to material and products of combustion pass through machine and out of stack. The shell has steel tires resting on chilled and ground bearing wheels which are supported on cast iron bases. These dryers will give a thermal efficiency of 45% and are built for a capacity as high as 1500 lbs. of water evaporation per hour.

Other types of Dryers are designed and installed when none of the above types are found suitable.

—RUGGLES-COLES ENGINEERING CO., NEW YORK.

**DRYERS, VACUUM CHAMBER PASSBURG SYSTEM.** The vacuum-chamber dryer is manufactured in various styles and sizes, of a special grade of close-grain cast iron and heavily ribbed on the outside to withstand the extreme pressures for maintaining the highest vacuum; with an appropriate number of heating shelves made from hydraulically straightened sheet-steel plates, ends and sides welded and centers reinforced with countersunk stay bolts, and tested to ninety pounds pressure. The chamber dryer is designed to remove water rapidly and at a low temperature without altering the chemical composition of the material being dried. The dryer is easily charged and operated. The chamber dryer is especially suitable for rubber, aniline and other dyes; alizarine, extracts, effervescent salts, chemical products, pharmaceutical preparations, incandescent mantles, casein, milk chocolate, etc.

—J. P. DEVINE COMPANY, BUFFALO, N. Y.

**DRYERS, VACUUM SINGLE AND DOUBLE DRUM, PASSBURG SYSTEM.** This type of drying apparatus is designed especially for solutions or emulsions of milk and food products, glue, gum, tannin and dyewood extracts, various albuminous substances, white lead, etc. The double drum is of the latest design and peculiarly adapted for the more sensitive materials. The outer casing being made of a special grade of cast iron, heavily ribbed to withstand pressure, and the drum of a special mixture of charcoal iron and scrap, when cast iron is used and of bronze or other metals or composition best suited to treat the material to be dried. The drum dryers produce a fine powder of perfect dryness continuously from solutions containing from ten to fifty per cent of solid matter. The drying process requires but a few seconds and the material is dried at a temperature of from 105° F. to 125° F.

—J. P. DEVINE COMPANY, BUFFALO, N. Y.

**DRYERS, VACUUM ROTARY.** A horizontal, cylindrical apparatus, hollow inside and steam heated around the exterior and also in the center. The material is placed in same, tumbled about by revolving medium, and finally, after being dried, is discharged. Steam heated, fire heated and hot air heated vacuum rotary dryers. The material is placed in the apparatus, dried at a low temperature and may be absolutely dried if necessary. A large output with an improved quality; low cost of operation; low steam consumption; simplicity of construction and small floor space are some of the advantages. This dryer is suitable for handling any granular substance, and is very rapid in its operation.

—BUFFALO FOUNDRY & MACHINE CO., BUFFALO, N. Y.

**DRYERS, VACUUM ROTARY.** Consists of a stationary steam jacketed cylinder in which revolves a steam heated tube or drum carrying mixing blades. These, as they revolve, agitate the materials, allowing the vapors to escape easily to the condenser and vacuum pump. The material can be conveyed to the machine by conveyor belts or similar means, and is fed into the cylinder through manholes on the top, provided with loose covers held in place by atmospheric pressure. When dry the material is discharged through the quick opening outlets in the bottom. This apparatus can be charged and emptied in fifteen minutes and only one operator is required in attendance where proper facilities are installed for conveying the materials. This apparatus includes dust filter, condenser and high-service vacuum pump. Capacity 100 lbs. to 3000 lbs. per charge. Used for drying salts, starch, feed, ores, baking powder, reclaimed rubber, or any material which can be agitated while drying.

—F. J. STOKES MACHINE COMPANY, PHILADELPHIA, PA.

**DRYERS, VACUUM ROTARY DRUM.** Drying solutions, emulsions, and pulps such as dyewood extracts, white lead, glues, milk, acids, chemicals, etc., or any liquid containing solids. The dryer consists of a hollow revolving drum, surrounded by a tightly sealed casing equipped with a device for applying a coating of liquid material to the drum and a corresponding appliance for removing the material in a dry condition and delivering it to suitable receivers. The drum is made of cast iron, bronze or special metals as required for acids or other materials. The casing surrounding the drum will be lined when required; the part of the casing containing the wet material will be lined with metal to withstand the action of the liquids. Agitators are provided for material requiring constant stirring. Steam is applied to the interior of the drum and the latter is revolved at the speed required for the material to be treated. A vacuum pump and a condenser are used in connection with the dryer and the drum rotates in a vacuum while in operation. On account of this vacuum the material is dried at an extremely low temperature, which prevents the overheating of the product. The material is applied at the bottom of the drum and is carried on the drum for three quarters of a revolution of the latter, when it is re-

moved continuously in a dry state and conveyed to one of the receivers. When one receiver is full the action of the conveyor is reversed and the material is diverted to the other receiver. While the second receiver is being filled, the first receiver is emptied of its stock. The valve between the dryer and receiver is closed during the unloading of the receiver, in order to avoid breaking the vacuum in the dryer. The moisture is removed by evaporation, hence no product is lost during the operation.

—BUFFALO FOUNDRY & MACHINE COMPANY, BUFFALO, N. Y.

**DRYERS, VACUUM, SAFETY.** Passburg system. A modification of the ordinary Passburg vacuum dryer, to meet the conditions for drying smokeless powder, fulminate of mercury, gun cotton, and other explosives. The apparatus is provided with an expansion chamber and other safety devices for the purposes of receiving in case of an explosion, the expanding gases and of reducing thereby their destructive power.

—J. P. DEVINE CO., BUFFALO, N. Y.

**DRYER, VACUUM SHELF.** The shelf dryer is adapted to dry sheet and reclaimed rubber of all kinds, rubber compounds, paints, dyes, extracts, pastes, glue, soap, salts, albumens, of all descriptions, starch, gluten, rosin, vegetables, fruits, sugars, small electrical apparatus, plates, chemicals, various by-products, granular and liquid substances. The dryer consists of a square or rectangular chamber containing hollow steam or hot water heated shelves, placed one above the other, the space between the shelves varying from  $2\frac{1}{2}$ " to 4". The chambers have a door at one or both ends for unloading purposes. The material to be dried being loaded in trays or pans, these are placed on the shelves. The apparatus is then closed up, the vacuum produced and the drying commenced. With the apparatus is furnished a vacuum pump and condenser, which produces and maintains a high vacuum during the drying operation.

—BUFFALO FOUNDRY & MACHINE COMPANY, BUFFALO, N. Y.

**DRYERS, VACUUM SHELF.** Rectangular vacuum shelf chambers made of cast iron, strongly ribbed to withstand a pressure of several atmospheres. The chambers are cast in four plates to insure perfect castings, joints are planed and fitted carefully requiring no gaskets to seal them. The advantage of this construction is that the chamber can be shipped in portable sections where it is to be installed in a factory having small entrance and no facility for handling heavy pieces. Hinged doors at one or both ends are provided for charging and emptying. The steam heating shelves, on which the material is placed, are seamless welded steel. Either steam or hot water, as conditions require, is supplied to and conducted from the shelves by means of two manifolds. The shelves are independent and can be detached separately without interfering with the others. The clearance space between shelves can be altered to suit requirements.

—F. J. STOKES MACHINE CO., PHILADELPHIA, PA.

**DRYERS, EXHAUSTERS FOR.** See Blowers, Piqua Positive.

**DRYING AND IMPREGNATING APPARATUS, VACUUM PASS-BURG SYSTEM.** The apparatus consists of a drying and impregnating chamber (either steam jacketed or heated with spiral steam coil); a liquor tank (also steam jacketed or containing a spiral heating coil) for the storage and to liquify the compound; steam-jacketed pipe and valve connecting the chamber and tank; a specially designed combined air pump and compressor capable of producing a high vacuum as well as a high pressure; and a condenser of proportionate capacity to meet requirements of each installation. The apparatus is designed not only for electric coils, cables, etc., but for the thorough impregnation of fabric, leather, wood, and other materials, with oils, coloring matter and waterproofing or fireproofing solutions.

—J. P. DEVINE Co., BUFFALO, N. Y.

**DRYING (VACUUM) AND IMPREGNATING APPARATUS.** For drying and impregnating with insulating compound, under vacuum, electric coils, cables, transformers, armatures, insulator pins, wood fillers, and electrical work of all descriptions. The apparatus consists of an impregnating tank, liquor tank, vacuum pump, condenser and auxiliaries. The tanks, connecting pipe and valve are heated with steam, gas or hot air. The material to be treated is placed in the impregnating tank, the moisture being rapidly evaporated and condensed under vacuum. The compound with which the material is to be impregnated is melted (if necessary) in the liquor tank. When the articles to be impregnated are thoroughly evacuated, the gate valve between the tanks is opened, the vacuum in the impregnating tank drawing the liquor into that tank until the articles to be treated are thoroughly covered. The vacuum is then broken and air at 100 lbs. pressure is then put on the liquor, this pressure being maintained until a thorough impregnation takes place. The liquid is then returned to the liquor tank by a slight air pressure, allowing the impregnated article to drain.

—BUFFALO FOUNDRY & MACHINE COMPANY, BUFFALO, N. Y.

**DRYING, SAWDUST BOXES.** Steam-heated sawdust boxes for drying quantities of small work in bulk. Made removable sections. The sawdust compartment is made of heavy galvanized iron and is heated by a steam coil. The stand is made of 1½ inch angle iron.

—THE HANSON & VAN WINKLE COMPANY, NEWARK, N. J.

**DRYING SYSTEM** for sulphuric acid concentration. See Sulphuric Concentration.

**DUST COLLECTOR.** *An apparatus for collecting floating dust created by various types of machinery, etc., and delivering the same at any convenient point. (See also "Gas Washer" "Smoke Consumer," Vapor Condenser.")*

**DUST COLLECTOR, OSBORNE POLYGONAL.** Is octagonal in shape, instead of being circular like the ordinary type of cyclone collector. The polygonal form of the collector gives much better

results in the separation of the dust from the air, so that practically all of the material delivered to the machine is collected and saved. This machine can be used in connection with any convenient system of piping for the removal and collection of all floating dust. It is very frequently used for collecting the fine dust escaping from the discharge end of rotary dryers, etc. When used for this purpose it saves the space otherwise needed for clumsy dust chambers, and at the same time collects a great deal more of the dust than is possible by any other method.

—GRISCOM-SPENCER Co., NEW YORK.

**DUST COLLECTOR, WATER.** Made of galvanized iron or other material to prevent rusting or rapid deterioration from other causes; is used for removing and precipitating dust, and also for absorbing obnoxious vapors and gases; finds application in mines for collecting precious metal dust, in stoneware and cement mills, paint factories, paper mills, breweries, etc. This dust collector is operated by pressure water atomized by means of Koerting centrifugal spray nozzles installed therein, the spray from which is exceptionally fine and even, and which completely absorbs the dust, etc. The air and dust is forced through the apparatus by means of jet ventilators or rotary fans but for some purposes neither is required, as the arrangement of sprays creates the necessary draft. The air, gases or dust enters at one end of the apparatus and is discharged at the other end completely cleaned. Catalog RR-4, AA-6 and CC-6.

—SCHUTTE & KOERTING Co., PHILADELPHIA, PA.

**DYNAMOS.** See Generators.

**EARTHENWARE CELLS.** Porous for electrochemical purposes, of superior quality, have given general satisfaction wherever used, made in round or rectangular shapes.

—J. W. SITTIG, NEW YORK.

**EARTHENWARE TILES.** Porous. Of great porosity and durability.

—J. W. SITTIG, NEW YORK.

**ELECTRIC STEEL FURNACES.** See Furnaces, Electric Steel.

**ELECTRODES, ACHESON-GRAPHITE.** Made by subjecting the ordinary carbon articles to the graphitizing process of the Acheson electric furnace. Possess four times the electrical conductivity of the amorphous carbon article. Real density 2.18. Contain 98.5% to 99.9% graphite. Tensile strength 850 to 1050 pounds per square inch. Resistance 0.00035 ohm per inch cube. Oxidizing temperature 1150° F. Of low porosity, rendering them highly resistant to chemical disintegrating action. Freedom from hydrocarbons, assures remarkably long life, one to two years, in chloride work. Ease of machining is a valuable and economic characteristic. In electrometallurgical work they have shown six times

the efficiency of amorphous carbon electrodes for equal electrode weights. Show marked economy in many electrolytic processes for producing zinc and copper in chloride solutions, chlorine, caustic soda, chlorates, gold and silver from cyanide solutions, etc., and in such electric-furnace work as the manufacture of steel, ferro-alloys, carbide and the like.

—INTERNATIONAL ACHESON GRAPHITE COMPANY, NIAGARA FALLS, N. Y.

**ELECTRODES, CARBON.** Amorphous carbon electrodes (Girod) of great strength and durability. For electric-furnace work, like steel refining.

—C. W. LEAVITT & Co., NEW YORK.  
(See also Carbon electrodes.)

**ELECTRO-GALVANIZING.** Sulphate of zinc. Full information on request.

—THE GRASSELLI CHEMICAL CO., CLEVELAND, OHIO, CHICAGO, ILL., AND NEW YORK.

**ELECTRO-GALVANIZING.** Electrogalvanizing, cold process. Plants furnished for complete equipments.

—HANSON & VAN WINKLE COMPANY, NEWARK, N. J.

**ELECTRO-GALVANIZING.** Machinery, apparatus, and accessories.

—ZUCKER & LEVETT & LOEB CO., NEW YORK.

**ELECTROLYSIS.** See Cells, electrolytic; also Electrogalvanizing and Electroplating.

**ELECTROPLATING CHEMICALS.** All chemicals used in the electrodeposition of metals.

—HANSON & VAN WINKLE CO., NEWARK, N. J.  
—ZUCKER & LEVETT & LOEB CO., NEW YORK.

**ELECTROPLATING CONNECTIONS.** Rod and wire connections of all styles and sizes for use in the plating room.

—HANSON & VAN WINKLE CO., NEWARK.  
—ZUCKER & LEVETT & LOEB CO., NEW YORK.

**ELECTROPLATING, MECHANICAL APPARATUS.** These machines are particularly adapted for electroplating large quantities of small work in bulk, saving time, labor and expense. They are being successfully operated with nickel, copper, brass, bronze and zinc plating solutions. Many articles come from the apparatus in a highly polished condition thus doing away with further hand operations.

—HANSON & VAN WINKLE COMPANY, NEWARK, N. J.

**ELECTROTYPING LEADS.** To give best results, the "leads" used by electrotypers for moulding and polishing should possess



different characteristics in order to prevent sticking or slipping of the work, the moulding lead should be slightly asperous, while polishing lead should be of high purity, in order to insure proper electrical conductivity, and great spreading and covering power. In the past it has been found necessary to "dope" natural graphite to meet some of the requirements of this field, but now the electric furnace process, operated by the International Acheson Graphite Co., makes "leads" that possess the varied qualities, their individual value being obtained through the use of different raw materials. in the production of each lead.

—INTERNATIONAL ACHESON GRAPHITE CO., NIAGARA FALLS, N. Y.

**ELEVATING AND CONVEYING MACHINERY.** For ore, coal, coke, etc. Made entirely of steel to insure special strength.

—SCAIFE FOUNDRY AND MACHINE CO., LTD., PITTSBURGH, PA.

**ELEVATORS AND AGITATORS OF STONE-WARE.** For lifting and stirring acids, can be worked either by steam or compressed air; very simple and efficient apparatus.

—J. W. SITTIG, NEW YORK.

(Other stoneware makers see Stoneware.)

**ENAMELED WARE OF CAST IRON.** For chemical purposes, made by the most prominent German manufacturers. The enamel is thoroughly acid-proof and can be subjected to high temperature. Very convenient for all kinds of chemical manufacturers; color and varnish works. The fact that this enamel sticks firmly to cast iron allows of the construction of even the largest apparatus, such as all kinds of kettles, stills, vats, and stirring apparatus, etc. Catalogs and samples gladly furnished.

—J. W. SITTIG, NEW YORK.

**ENAMELED WARE OF CAST IRON.** Steam-jacketed kettles, etc.

—STUART & PETERSON CO., BURLINGTON, N. J.

**ENAMELING FURNACE BLOWERS.** See Blowers, Piqua Positive.

**ENAMELING FURNACES.** See Furnaces, Enameling.

**ENGINES.** Simple, engines, tandem-compound, or cross-compound, condensing or non-condensing, direct-connected, belt or rope drive, or geared. Cylinders fitted with either piston or Corliss valves. Reversing engines, either direct-connected or geared, twin-cylinder. Cross-compound, or twin tandem-compound. Blowing engines (horizontal or vertical), simple or cross-compound.

—MACKINTOSH, HEMPHILL & CO., PITTSBURGH, PA.

**ENGINES.** See Gas Engines and Steam Engines.

**EUREKA MILL.** See Crushing and Grinding, Eureka Mill.

**EVAPORATING DISHES.** Of acid-proof stoneware, in all sizes and shapes; can be made with spouts and handles if desired.  
—**DIDIER-MARCH COMPANY, NEW YORK.**

**EVAPORATING PANS.** Graham chemical stoneware pans for evaporating corrosive solutions are made in various stock sizes and can be furnished to order in any sizes. Guaranteed chemical proof and of superior heat-resistance.

—**CHARLES GRAHAM CHEMICAL POTTERY WORKS, BROOKLYN, N. Y.**  
(Other stoneware makers see Stoneware.)

**EVAPORATING PANS,** shallow or deep form of stone-ware or cast-iron enameled ware.

—**J. W. SITTING, NEW YORK.**

**EVAPORATING PANS.** Fused silica, for the concentration of sulphuric and other acids by the well-known cascade processes. Entirely acid-proof, and can be subjected to the direct heat of the furnace without danger of breakage. (See also Quartz, fused in part II of this Dictionary.)

—**THE THERMAL SYNDICATE LTD., NEW YORK.**

**EVAPORATING PANS.** See also Castings, Chemical.

**EVAPORATING POTS.** Specially designed to resist the action of caustic or acids. A specialty made of castings from blue prints furnished by designers, engineers, and superintendents. Plans or estimates furnished for complete acid and chemical plants.

—**BETHLEHEM FOUNDRY & MACHINE CO., SOUTH BETHLEHEM, PA.**

**EVAPORATING POTS.** These pots as well as retorts and pans for acids and alkalis are made of the purest iron, with additions necessary to make the iron resist the action of corrosive chemicals. Special methods of moulding produce a kettle of great smoothness, which is essential for a large output of caustic material. Pots made by this company have turned out over 2500 tons of caustic soda.

—**BUFFALO FOUNDRY & MACHINE COMPANY, BUFFALO, N. Y.**

**EVAPORATORS.** *Apparatus usually operated under a vacuum in which all kinds of dilute liquors are economically concentrated by means of steam at low pressure—usually exhaust steam. Built in any number of units or effects, although the practical limit for most liquors has been found to be a quadruple effect. This limit depends entirely upon the nature of the liquor and the amount of steam available. The economy of evaporators lies in the repeated use of the latent heat in the steam, and the amount necessary is approximately inversely proportional to the number of effects. A pound of steam will evaporate (roughly) five times as much water in a quadruple effect as in an open*

*tank. Each effect contains tubular heating surfaces in which the steam coming from the previous effect is condensed. The heat liberated by this condensation produces an equal amount of evaporation and the steam formed is in turn condensed in the succeeding effect. This repeated use of the steam is possible because of the successive reduced pressures and consequently lower boiling points in the successive effects.*

**EVAPORATORS, BADGER.** Single and multiple-effect evaporators for extracts of all kinds. The great variety of liquors requiring evaporation makes necessary the use of particular types of apparatus in each particular case. Particular attention paid in the design to the proper proportioning of the different parts with reference to each other. High economy as regards cost of operation and a large amount of product in unit of time. These evaporators are made for all purposes.

—E. B. BADGER & SONS CO., BOSTON, MASS.

**EVAPORATORS, BAEUERLE AND MORRIS.** Multiple-effect vacuum evaporators. Our evaporators are of the short vertical tube type with tubes expanded into tube sheets at both ends and liquor circulating through inside of tubes. By this arrangement of tubes all glands, stuffing boxes and rubber gaskets, etc., are avoided and no trouble from leaking tubes is experienced. Design gives a very rapid circulation of material to be evaporated and if necessary allows for an easy cleaning by mechanical means as each tube is four feet or less long and can be cleaned with a wire brush or scraper. Shells and heating surfaces are made from material best suited for desired service.

—BAEUERLE & MORRIS, PHILADELPHIA.

**EVAPORATORS, BUFFALO FOUNDRY.** Single, double, triple and multiple effect evaporators of cast iron, copper, bronze and of special materials. Steam jacketed, coil type, or both; also with agitators, if desired. Evaporators with a large outlet at the bottom for heavy materials. Our evaporators are fitted with surface, barometric or jet condensers and wet or dry vacuum pumps, according to the conditions they are required to operate under.

—BUFFALO FOUNDRY & MACHINE CO., BUFFALO, N. Y.

**EVAPORATORS, DOPP VACUUM.** Consist of cast-iron seamless steam-jacketed kettles forming the bottom half, upon which is mounted a dome, also seamless, the two being bolted together with packing between. By means of a stuffing box, a mixing device can be introduced. By means of a suitable piping, it is connected to a condenser and vacuum pump. This apparatus is used for evaporating, distilling, refining, mixing and drying a variety of materials in vacuo. They range in size, total contents, from ten to one thousand gallons.

—SOWERS MFG. CO., BUFFALO, N. Y.

**EVAPORATORS, FALLER.** Single and multiple-effect vacuum evaporators for great varieties of liquors. The chief advantages of

our "Rapid" evaporators, aside from the fuel economy, consist in the ease and rapidity of working, uniformity of product with varying liquors and the control possible at all times. The process is principally automatic, less labor and practically no skill in handling being required. The quadruple-effect "Rapid" evaporator, especially designed for the manufacture of salt embodies other qualities of undisputed superiority, such as the ability to produce both, fine and coarse grained crystals, which are removed from the pans in a dry state (containing not over 5% moisture); ready for packing. Complete elimination of gypsum or other scales on heating surfaces, without previous treatment of brine. Highest efficiency guaranteed.

—RAPID EVAPORATOR COMPANY, DETROIT, MICH.

**EVAPORATORS, KESSLER,** for Sulphuric acid concentration. See Sulphuric Concentration.

**EVAPORATORS, KESTNER FILM.** Operates on the principle of film evaporation. The design is such that the film is forced to cling to the heating surface independent of gravity, instead of being forced away from the hot surface by the steam disengaged. This means a highly effective use of the heating surface and the possibility of concentration to the desired degree in one passage through the tubes. Over 650 pans are at present in successful operation, treating a great variety of materials.

—KESTNER EVAPORATOR CO., PHILADELPHIA, PA.

**EVAPORATORS, REILLY MULTICOIL.** The heating surface is of copper tube coiled to a small radius, which tubes being secured by ground union joints are readily removable through the large man-hole door in the shell of evaporator. The construction offers peculiar advantages for cleaning the interior of the evaporator, for removing salt or other solid deposits, or renewing tubes in case of corrosion from use for evaporating or concentrating liquids which affect the metal. Plants are furnished of single or multiple effect, as required, and efficiencies can be obtained up to the limit of practical possibilities.

—THE GRISCOM-SPENCER CO., NEW YORK.

**EVAPORATORS, STOKES VACUUM.** Either copper or iron vacuum pans or stills, from 25 gallons capacity upwards. Single or multiple-effect vertical evaporators for concentrating various solutions.

—F. J. STOKES MACHINE CO., PHILADELPHIA, PA.

**EVAPORATORS, SWENSON TYPE,** and other styles for concentrating any kind of dilute liquor. Over 500 of our evaporators now in use for caustic soda, black liquor, distilling waste, tankwaters of all kinds, beet and cane juice, glucose, packing house liquors, extracts, glue, "spent" lye and other solutions and liquid waste of many kinds. Designs submitted for any proposition and estimates prepared as to the saving possible through the use of an evaporator.

For general purposes, our standard Swenson type is the best known and most widely used equipment. Heavy cast iron, bronze, copper or steel construction with any type of heating surface. Swenson pans have the tubes secured by removable packing plates and elastic gaskets, making it possible to easily make repairs with ordinary labor. No moving parts, such as floats, to get out of order and no tubes to clog up and reduce capacity. The liquor surrounds the tubes which are always completely submerged, thus preventing burning on same. Perfect circulation assisted when occasion demands by properly proportioned downtake. Liquor always in sight and final density easily controlled and maintained at any desired point. Concentration all effected in one passage through the evaporator. Swenson effects are easiest to keep in a highly efficient condition and to clean and are simplest in operation. Everything easily understood by ordinary labor; "the \$1.50 per day" kind being generally employed to run our evaporators. Simplicity in design, heavy construction, and absence of moving parts, all assist in keeping repair expense at a minimum. Special provision made to guard against loss by entrainment or foaming by means of internal or external catchalls and added vapor space. Salts and other solids precipitated or deposited during the boiling, taken care of in the design. Single and multiple effects built for capacities up to 15,000 gallons per hour. Among the advantages of the Swenson system are:—superior efficiency of horizontal heating surfaces—low liquor depth and consequently a uniformly low temperature throughout same—rapid evaporation and short time during which the liquor is in evaporator—no pumping of liquors between effects—accessibility of all working parts—ability to finish a small batch—large boiling surface and vapor space above same, reducing possibility of entrainment losses—positive circulation—higher density than with any other type—steam fully condensed insuring maximum economy, and small head room necessary. Propositions made upon receipt of complete information on quantity and nature of liquor to be handled, impurities in solution or suspension, boiling peculiarities, amount of precipitation limiting densities, etc.

—SWENSON EVAPORATOR COMPANY, CHICAGO, ILL., (Formerly American Foundry & Machinery Co.)

**EVAPORATORS, ZAREMBA.** The great variety of liquors and of the circumstances met with in practice make imperative the use of particular types of apparatus in particular cases. This concern of evaporator engineers recommends one of six general types.

*Type 1.*—For ordinary work:—Zaremba patent evaporator consisting of a vertically cylindrical shell fitted with horizontal tubes submerged in the liquor to be concentrated. Steam inside the tubes. This machine is the simplest in make-up and operation, and the most economical in maintenance on the market. Built in sizes from 150 gallons to 15,000 gallons per day.

*Type 2.*—For liquors tending to produce bad deposits on the heating surface:—vertically cylindrical shell with vertical tubes,

having the liquor inside the pan. Large annular downtake. Rapid circulation largely prevents deposits, which in case of evaporation can be readily removed without interfering with the machine.

*Type 3.*—For liquors from which crystals are precipitated during concentration, such as electrolytic salt caustic:—Pans similar to Type 2, but fitted with coned bottoms for catching the precipitated crystals, from which they are passed to vacuum filters underneath. Crystals can be washed clean from liquor and removed from filter without interfering with operation of evaporator.

*Type 4.*—For extra high concentration of liquors:—Mantius high concentrator working under high vacuum with steam at ordinary boiler pressure. Can be used for almost any liquor.

*Type 5.* For foaming liquors and such as can not stand high temperatures:—liquors passed rapidly through horizontal tubes with very short exposure to heat. All difficulties due to foaming entirely eliminated.

*Type 6.*—For manufacture of salt from brine:—Mantius superheating evaporator, which makes impossible any deposit of gypsum or salt on the heating surface. No previous treatment of the brine necessary. Can work in quadruple effect using exhaust steam only. Cleaning can be performed without stopping operations.

These apparatus represent the best results of old practice combined with latest practical improvements. Where design permits, antiquated types of apparatus are fitted with these improvements. Inquiries specially solicited with reference to difficult evaporator work.

—ZAREMBA COMPANY, BUFFALO, N. Y.

**EVAPORATORS, EXHAUSTER OR BLOWERS FOR.** See Blowers, Piqua Positive; also Exhausters.

**EXCELSIOR MILL.** See Crushing and Grinding, Excelsior Mill

**EXHAUST FANS.** See also Blowers.

**EXHAUSTERS.** Air or Gas. See Blowers, Piqua Positive.

**EXHAUSTERS.** Of acid-proof stoneware, for expelling gases, can also be used in absorbing and condensing plants. Are driven either by belt or electric motor. Exhausters tested 50% in excess of their rated speed. In 5 sizes from a capacity of 426 cu. ft. per minute, to 6372 cu. ft. per minute. These exhausters in the larger sizes can be had with iron casing if desired.

—DIDIER-MARCH COMPANY, NEW YORK.

**EXHAUSTERS.** Chemical-stoneware exhaust-fans in three sizes, handling 50, 510 and 2600 cubic feet per minute, respectively. Most practical ventilating device for handling corrosive gases, as all working parts are constructed of non-corrosive material. Each fan tested at twice operating speed before shipment. Fans are supplied

complete with iron work and tight pulley, ready for operation. Full description in catalog.

—CHARLES GRAHAM CHEMICAL POTTERY WORKS, BROOKLYN, N. Y.

**EXHAUSTERS.** Rotary Positive for air or gas, large variety of sizes from 3 cubic feet per minute up and for maintaining 6 or 8 pounds vacuum.

—THE PIQUA BLOWER COMPANY, PIQUA, OHIO.

**EXHAUSTERS.** Of stone-ware of the latest and most improved style; especially suited for dealing with large quantities of air and acid vapors, etc. No corrosion; made for belt driving or for driving by electric motors; made in four different sizes for 4, 6, 8, and 12 pipe connection.

—J. W. SITTIG, NEW YORK.

**EXHAUSTERS and Compressors for Creating Vacuum.** Are constructed of lead, brass and iron, with platinum, steam nozzle, operated by steam, water, air, oil, etc., and used for rarefying creosoting tanks, priming centrifugal pumps, lifting acids (without diluting) oxidizing caustic liquors, agitating liquors by forcing air into them, distillation of fats, oils, etc., under vacuum, bleaching palm oil, etc. The admissible vacuum and counter pressure to which these apparatus are constructed is a rarefaction up to 20 inches of mercury and above, or a counter pressure up to  $1/7$  of the steam pressure. This apparatus may be placed horizontally or vertically, discharging upwards, downwards or horizontally. Made in ten standard sizes ranging in capacity of from 100 to 60,000 cubic feet of air per hour. Catalog EE-4, PP-4 and QQ-4.

—SCHUTTE & KOERTING CO., PHILADELPHIA, PA.

**EXPANSION JOINTS, ATWOOD.** Provision must be made in pipe lines subject to changes of temperature to allow proper expansion and contraction without undue strain. Pipe bends of liberal radii are most satisfactory as they require no attention. Swivel joints may be used when a line need not be straight and balanced or unbalanced packed joints for straightway work. Unless installed with great care, unbalanced joints for high pressure steam are dangerous.

—PITTSBURGH VALVE, FOUNDRY & CONSTRUCTION CO., PITTSBURGH, PA.

### **FEED WATER HEATERS.**

—ALLIS-CHALMERS CO., MILWAUKEE, WIS.

**FEED WATER HEATERS, REILLY MULTICOIL.** These heaters are of tubular type, the heating surface being formed of copper tubes coiled to a small radius, through which the water circulates. The length of the travel through each tube insures an equal flow of water and the highest possible terminal temperatures. The feature of the Reilly apparatus is the attachment of the coils by ground union

joints of bronze, and the provision of a large door in the shell of the heater, by which the coils may be inspected or removed in a few moments.

—THE GRISCOM-SPENCER CO., NEW YORK.

**FEED WATER PURIFIER.** Tri-sodium phosphate for softening water. Removes scale and prevents incrustations in boilers.

—THE GRASSELLI CHEMICAL CO., CLEVELAND, OHIO, CHICAGO, ILL., AND NEW YORK.

**FERRO-ALLOYS.** *Alloys of iron with special elements, for use in steel refining and in the manufacture of special steels.*

#### **FERRO-BORON.**

—GEO. G. BLACKWELL, SONS & CO., LTD., LIVERPOOL, ENG.

#### **FERRO-CHROME.**

—GEO. G. BLACKWELL, SONS & CO., LTD., LIVERPOOL, ENO.

—FUERST BROS. & CO., NEW YORK.

—C. W. LEAVITT & CO., NEW YORK.

**FERRO-CHROME.** 65 to 70% of the usual and of the lowest carbon contents. General sales agents for products of Electro Metallurgical Co., New York.

—E. J. LAVINO & CO., PHILADELPHIA, PA.

**FERRO-CHROME.** Free from carbon. In nuggets. "Ruthlock" Brand.

—MARCUS RUTHENBERG, LONDON.

**FERRO-CHROME.** Ordinary 65-72% Cr, with 4-6%, 6-8%, 8-10% C. Mild X, 60-65% Cr, with  $\frac{1}{2}$ -1% C. Mild XX, 65-70% Cr, with  $1\frac{1}{2}$ % C.

—ROESSLER & HASSLACHER CHEMICAL CO., NEW YORK.

**FERROINCLAVE** is a sheet steel with dovetail corrugations which are inversely tapered, and is used as a reinforcement for concrete roofs, floors, sidewalls, partitions, stairs, coal bins, highway bridges, culverts, tanks, silos, etc.

—THE BROWN HOISTING MACHINERY CO., CLEVELAND, OHIO.

#### **FERRO-MANGANESE.**

—ATKINS, KROLL & CO., SAN FRANCISCO, CAL.

—C. W. LEAVITT & CO., NEW YORK.

**FERRO-MANGANESE.** Our grade contains from 80% to 85% manganese.

—ELECTRIC SMELTING & ALUMINUM CO., LOCKPORT, N. Y.

**FERRO-MANGANESE.** Standard 80% grade. Also 85 to 90% carbon less ferro-manganese.

—E. J. LAVINO & CO., PHILADELPHIA, PA.



**FERRO-MANGANESE.** 80-85% Mn, with 6-7% C. Lumps, also ground. Refined X 85-90% Mn with 2-3% C.

—ROESSLER & HASSLACHER CHEMICAL CO., NEW YORK.

**FERRO-MANGANESE.** Free from carbon. In nuggets, "Ruthlock" brand.

—MARCUS RUTHENBURG, LONDON.

**FERRO-MOLYBDENUM.**

—GEO. G. BLACKWELL, SONS & CO., LTD., LIVERPOOL, ENG.

—C. W. LEAVITT & CO., NEW YORK.

**FERRO-MOLYBDENUM.** 75 to 85%. Low in carbon.

—E. J. LAVINO & CO., PHILADELPHIA, PA.

**FERRO-MOLYBDENUM.** Regular, 50%, 70-75%, 80-90%, Mo, with 3% C. and 0.10% S. Refined X, 75-80% Mo, with 1% C. and 0.05% S.

—ROESSLER & HASSLACHER CHEMICAL CO., NEW YORK.

**FERRO-MOLYBDENUM.** Free from carbon "Ruthlock" brand.

—MARCUS RUTHENBURG, LONDON.

**FERRO-NICKEL** Wire. See Wire.

**FERRO-PHOSPHORUS.** 20 to 25%.

—E. J. LAVINO & CO., PHILADELPHIA, PA.

**FERRO-PHOSPHORUS.**

—C. W. LEAVITT & CO., NEW YORK.

**FERRO-PHOSPHORUS.** 15-20%, 23-25% P.

—ROESSLER & HASSLACHER CHEMICAL CO., NEW YORK.

**FERRO-SILICON.**

—ATKINS, KROLL & CO., SAN FRANCISCO, CAL.

—GEO. G. BLACKWELL, SONS & CO., LTD., LIVERPOOL, ENG.

—FUERST BROS. & CO., NEW YORK.

—C. W. LEAVITT & CO., NEW YORK.

**FERRO-SILICON.** Grades from 50 to 75%. 50% ferro-silicon always in stock for immediate delivery. General sales agents for products of Electro Metallurgical Co., New York.

—E. J. LAVINO & CO., PHILADELPHIA, PA.

**FERRO-SILICON.** Electric furnace make, 25-30%; 50-60%; 70-80%; 90-95% Si. Low in carbon, phosphorous and sulphur.

—ROESSLER & HASSLACHER CHEMICAL CO., NEW YORK.

**FERRO-SILICON.** See also Silicon and Carborundum.

**FERRO-SILICON-ALUMINIUM.** Our alloy contains 42 to 45% silicon and 13 to 16% aluminium, and is a valuable deoxidizing agent in iron and steel work.

—C. W. LEAVITT & Co., New York.

**FERRO-TANTALUM.**

—GEO. G. BLACKWELL, SONS & Co., LTD., LIVERPOOL, ENG.

**FERRO-TITANIUM.** (20-25% Ti.) Registered trade-mark "Thermit". Free from carbon, technically free from iron and used as an alloy for steel.

—GOLDSCHMIDT THERMIT Co., New York.

**FERRO-TITANIUM.**

—E. J. LAVINO & Co., PHILADELPHIA, PA.

—C. W. LEAVITT & Co., New York.

**FERRO-TITANIUM.** 20-25% Ti, with low or high carbon contents.

—ROESSLER & HASSLACHER CHEMICAL Co., New York.

**FERRO-TUNGSTEN.** See also Scheelite.

**FERRO-TUNGSTEN.** For high-speed steels, tool steel, etc., and steel where great strength and toughness is required.

—C. W. LEAVITT & Co., New York.

—GEO. G. BLACKWELL, SONS & Co., LTD., LIVERPOOL, ENGLAND.

**FERRO-TUNGSTEN.** 80 to 85%. Low in carbon.

—E. J. LAVINO & Co., PHILADELPHIA, PA.

**FERRO-TUNGSTEN.** Regular, 50%, 70-75%, 80-90% W, with 2.50-3.00% C. Refined X, 80-85% W, with 0.15 to 0.50 % C.

—ROESSLER & HASSLACHER CHEMICAL Co., New York.

**FERRO-TUNGSTEN.** 50% W, 50 Fe.

—MARCUS RUTHENBERG, LONDON.

**FERRO-VANADIUM.** (30 to 40% Vanadium.) Commercially free from carbon. Is being extensively used for alloying with steel and iron, imparting remarkable strength and wearing qualities to the metal and increasing its resistance to deterioration from shock and impact.

—AMERICAN VANADIUM Co., PITTSBURGH, PA.

**FERRO-VANADIUM.**

—GEO. G. BLACKWELL, SONS & Co., LTD., LIVERPOOL, ENG.

**FERRO-VANADIUM.** (25% Va.) Registered trade-mark "Thermit." Produced free from carbon by the aluminothermic process.

Particularly advantageous for alloying in small quantities with steel, as steel so treated possesses greater power to resist fatigue.

—GOLDSCHMIDT THERMIT CO., NEW YORK.

**FERRO-VANADIUM.** 25 to 30%. Carbonless.

—E. J. LAVINO & CO., PHILADELPHIA, PA.

**FERRO-VANADIUM.**

—C. W. LEAVITT & CO., NEW YORK.

**FERRO-VANADIUM.** 10 to 15% and 20 to 30%.

—PRIMOS CHEMICAL CO., PRIMOS, PA.

**FERRO-VANADIUM.** 30-35% V, 0.75 to 1% Si, Al and C.

—ROESSLER & HASSLACHER CHEMICAL CO., NEW YORK.

**FILTER FOR MINERAL WATER WORKS.** Of acid resisting stoneware.

—J. W. SITTIG, NEW YORK.

(Other stoneware makers see Stoneware.)

**FILTER PRESS.** *Consists of a series of chambers formed either by recessed plates or by flush plates with frames between them. Is used for the rapid separation of solids from liquids under pressure for the recovery of either or both.*

**FILTER PRESS.** For metallurgical and experimental work. For extraction of gold solutions from slimes. Our hydraulic closing slime press is of the flush plate and division frame type and contains the best features of the foreign type of press so successfully used for the treating and washing of slimes. We also build special filter presses for the separation of precipitates in the chlorination process and for the separation of zinc dust precipitates in the cyanide process; also a press for cleaning up of zinc slimes from precipitating boxes in the cyanide process, and a press for general quick separation of solids held in suspension and drying of same into solid cakes. Filter presses with square plates and frames and with round recessed plates.

—WILLIAM R. PERRIN & CO., CHICAGO, ILL.

**FILTER PRESS, SHRIVER.** Made in all types, for all purposes. Chambers made of cast iron, bronze, aluminium, hard lead or wood. Jacketed presses for filtering liquids at high or low temperatures. The pyramid drainage surface on plates gives highest efficiency. Quick opening and closing devices saves time in operating. Accurate machine work on the joint surfaces insures tight joints. Highest grade castings used and best workmanship.

—T. SHRIVER & CO., HARRISON, N. J.

**FILTER PRESS.** Sperry's patent improved filter press is equipped with a plate that differs radically from all others. The radial

grooves lead the liquid directly to the outlet. Being deep and rounded where they touch the cloth and of proper cross-section, the hug of the cloth cannot close the passage. They eliminate need of perforated metal. Save 50% in wear of cloths, produce a dryer cake, and are very rapid.

—D. R. SPERRY & CO., BATAVIA, ILL.

**FILTER, SLIMES.** Exclusive owners of the Moore process. Has made fine grinding (all sliming) the universally adopted method of ore treatment, and has revolutionized the old leaching method.

—THE MOORE FILTER CO., NEW YORK.

**FILTER, SUCTION.** Of acid-proof stoneware, in all sizes and shapes, both for manufacturing purposes and laboratory use.

—DIDIER-MARCH COMPANY, NEW YORK.

(Other stoneware makers see Stoneware.)

**FILTER, SUCTION, STONEWARE.** In all sizes with perforated diaphragm, for 'quick filtration. Of best chemical stoneware, guaranteed proof against muriatic, nitric and sulphuric acids, chlorine, etc., etc.

—CHARLES GRAHAM CHEMICAL POTTERY WORKS, BROOKLYN, N. Y.

(Other stoneware makers see Stoneware.)

**FILTER, SUCTION.** Of stoneware, cylindrical or conical shape, with tightly ground-in strainers. Have given general satisfaction on account of their suitable construction and great durability.

—J. W. SITTIG, NEW YORK.

**FINE CRUSHER.** See Crushing and Grinding, Crusher.

**FIREARMS LUBRICANT.** Finely ground, unctuous Acheson graphite, grade "1340," is the only suitable lubricant available for high-power rifles, as it is non-volatile and infusible. It reduces friction and metallic fouling, prevents erosion, assuring greater range and increased accuracy, while greatly prolonging the life of the gun barrel.

—INTERNATIONAL ACHESON GRAPHITE CO., NIAGARA FALLS, N. Y.

**FIRE BRICK.** See Brick Fire.

**FIRE CLAY.**

—THE ASHLAND FIRE BRICK CO., ASHLAND, KY.

(See also Brick, Fire, and Refractories.)

**FIRE CLAY.** Ground.

—HARBISON-WALKER REFRACTORIES CO., PITTSBURGH, PA.

**FIRE SAND.** See Carborundum Fire Sand.

**FLOUR MILL Machinery.** Has revolutionized the milling industry.

—ALLIS-CHALMERS CO., MILWAUKEE, WIS.

**FLUORSPAR.** Kentucky and Illinois. Lump; washed gravel; unwashed gravel.

—E. J. LAVINO CO., PHILADELPHIA, PA.

**FLUORSPAR.**

—PENN SALT MFG. CO., PITTSBURGH, PA.

**FLUX.** Granulated chloride of zinc for brass, copper, and aluminium foundries.

—SANDOVAL ZINC CO., EAST ST. LOUIS, ILL.

**FLY WHEELS.**

—MACKINTOSH, HEMPHILL & CO., PITTSBURGH, PA.

**FORGE FURNACE.** See Furnace Forge.

**FORGE FURNACE BLOWERS.** See Blowers, Piqua Positive.

**FORGE LININGS.** See Linings.

**FOUNDRY BLOWERS.** See Blowers, Piqua Positive.

**FOUNDRY PRACTICE WITH THERMIT.** (1) The thermit reaction (see "Aluminothermics") provides a ready means of introducing in an iron ladle a material which will stir up or pole the entire contents of the ladle and at the same time produce an increased temperature. For this purpose the thermit is placed in cylindrical cans with a sleeve in the middle, suitable for passing on an iron rod. The iron rod is held under the surface of the metal, where the reaction takes place. By this means the iron is prevented from getting too dull to pour. It also helps the foundryman to make so-called "semi-steel" castings in the ladle, by assisting him in properly distributing the steel while in the state of fusion. (2) The thermit reaction offers a convenient means of purifying the iron in the ladle, by reducing the harmful presence of nitrogen in the molten metal. A special thermit, consisting of pulverized aluminium and a titanium iron oxide, is made up in solid form, in cylindrical cans, as described in (1). The titanium set free during the reaction is insufficient to alloy with the iron, but quite adequate to combine with the nitrogen in the ladle, forming a cyanonitride of titanium. During this formation, the entire contents of the ladle are stirred up and give the gases an opportunity to escape. The iron will be somewhat hotter and distinctly more fluid, and the castings made from this iron will be distinguished by greater density of grain—being especially adapted for castings having to stand pressure, such as cylinders, valves, etc. (3) The property of the thermit reaction

to increase the temperature of liquid iron or steel under which it is submerged, is utilized to decrease the size of the risers of steel castings. The thermit, placed in suitable cans, is held in the neck of the riser, which is thus kept in a liquid state for a longer time and facilitates the proper feeding of the casting. The same principle is applied very successfully to reduce the size of lost heads of steel ingots.

—GOLDSCHMIDT THERMIT CO., NEW YORK.

### **FOUNDRY SUPPLIES.**

- ELECTRIC SMELTING & ALUMINUM CO., LOCKPORT, N. Y.
- HARRISON-WALKER REFRACTORIES CO., PITTSBURGH, PA.
- MONARCH ENGINEERING & MFG. CO., BALTIMORE, MD.
- NORTHERN ENGINEERING WORKS, DETROIT, MICH.
- W. S. ROCKWELL CO., NEW YORK.
- ROCKWELL FURNACE CO., NEW YORK.

### **FOUNDRY SUPPLIES.** Special high-grade moulding clay.

- LACLEDE CHRISTY CLAY PRODUCTS CO., ST. LOUIS, MO.

**FREQUENCY CHANGERS.** Westinghouse motor generator and frequency-changing sets for transforming current supply to meet all special processes.

- WESTINGHOUSE ELECTRIC & MFG. CO., PITTSBURGH, PA.

### **FRUE YANNERS.**

- ALLIS-CHALMERS CO., MILWAUKEE, WIS.
- COLORADO IRON WORKS CO., DENVER, COLO.

**FULLER MILL.** See Crushing and Grinding.

### **FULLER'S EARTH.**

- E. J. LAVINO & CO., PHILADELPHIA, PA.

### **FUNNELS.** Of hard rubber.

- AMERICAN HARD RUBBER CO., NEW YORK.

**FUNNELS AND PERCOLATORS.** Of stoneware in all styles and sizes, also provided with stop cock.

- J. W. SITTIG, NEW YORK.

(Other stoneware makers see Stoneware.)

**FUNNELS, SAFETY.** Made of acid-proof stoneware in various sizes and styles; these funnels are so shaped that liquid poured through them forms a seal.

- DIDIER-MARCH COMPANY, NEW YORK.

(Other stoneware makers see Stoneware.)

**FURNACES, ANNEALING.** Electrically operated; absolutely uniform temperature, perfect control, absence of all products of combustion. For small metal work and lenses.

- HOSKINS MANUFACTURING COMPANY, DETROIT.

**FURNACES, ANNEALING.** Built in all sizes for oil or gas fuel and constructed in such a manner that a perfect uniform and controllable temperature may be maintained throughout the chamber.  
—ROCKWELL FURNACE CO., NEW YORK.

**FURNACES, ANNEALING, REVOLVING TYPE.** For all small pieces of like dimensions such as cartridge shells, eyelets, ferrules, buttons, caps, cups, coin blanks, rivets, bolts, etc., three sizes: 500, 1,000 and 1,500 pounds capacities per hour. Catalog 2.  
—ROCKWELL FURNACE CO., NEW YORK.

**FURNACES, ANNEALING, STATIONARY TYPES.** For brass and copper rolling mills, wire mills, aluminium works, malleable iron works, steel foundries, bolt and nut works, cartridge factories, silver ware, mint work, electrical work, automobile parts and material of every kind and shape in all lines of manufacture. Revolving furnace for automatic annealing.  
—ROCKWELL FURNACE CO., NEW YORK.

**FURNACES, ANNEALING STATIONARY TYPES.** For brass and copper rolling mills, wire mills, aluminium works, malleable iron works, steel foundries, bolt and nut works, cartridge factories, silverware, mint work, electrical work, automobile parts and material of every kind and shape in all lines of manufacture. Revolving furnace for automatic annealing.  
—W. S. ROCKWELL COMPANY, NEW YORK.

**FURNACES, ANNEALING REVOLVING TYPE.** For all small pieces of like dimensions such as cartridge shells, eyelets, ferrules, buttons, caps, cups, coin blanks, rivets, bolts, etc., three sizes: 500, 1,000 and 1,500 pounds capacities per hour. Catalog 2.  
—W. S. ROCKWELL COMPANY, NEW YORK.

**FURNACES, ANNEALING.**  
—MONARCH ENG. & MFG. CO., BALTIMORE, MD.

**FURNACES, BARIUM-CHLORIDE.** For the treatment of high-speed steel, etc. These furnaces are built in several sizes of crucible for a wide range of work. Can be fired with oil fuel.  
—ROCKWELL FURNACE CO., NEW YORK.

**FURNACES, BLAST.** For gold, silver, copper and lead ores. Pioneers and long specialists in the design and construction of water jacket blast furnaces, hot and cold blast, and designers and builders of complete smelting plants. Catalog "Some details as to smelting practice and equipments."  
—COLORADO IRON WORKS CO., DENVER, COLO.

**FURNACES, BRAZING.** Electrically operated. For tubes and rods of brass, copper and steel.  
—HOSKINS MANUFACTURING COMPANY, DETROIT.

**FURNACES, BRAZING.**

—MONARCH ENG. & MFG. CO., BALTIMORE, MD.

**FURNACES, BRAZING.** For brass, copper and steel tubing, trolley wire, copper smith's work, etc., all styles and sizes.

—ROCKWELL FURNACE CO., NEW YORK.

**FURNACES, BRAZING.** For brass, copper and steel tubing, trolley wire, copper smith's work, etc., all styles and sizes.

—W. S. ROCKWELL COMPANY, NEW YORK.

**FURNACES, CARBONIZING.** For the carbonization of electric lamp filaments, etc. Uniform and controllable temperature to insure perfect results are secured by gas or oil fuel. These furnaces are made in several sizes.

—ROCKWELL FURNACE CO., NEW YORK.

**FURNACES, CASE-HARDENING.** For engine, automobile, gun and all other kinds of work. All sizes and styles.

—ROCKWELL FURNACE CO., NEW YORK.

**FURNACES, CUPEL.** Electrically operated, producing high temperatures by resistance, no combustion. For cupel work in assay laboratories and in mints.

—HOSKINS MANUFACTURING COMPANY, DETROIT, MICH.

**FURNACES, CUPEL.**

—MONARCH ENG. & MFG. CO., BALTIMORE, MD.

**FURNACES, CUPEL.** For assaying and mint work. All sizes.

—ROCKWELL FURNACE CO., NEW YORK.

—W. S. ROCKWELL COMPANY, NEW YORK.

**FURNACES, ELECTRIC.** Quartz-lined, which permits to heat it up quickly without danger of cracking its interior, for hardening small tools, determining the recalescent points of steel and general laboratory work. Used preferably in connection with the Bristol recording pyrometer.

—BRISTOL CO., WATERBURY, CONN.

**FURNACES, ELECTRIC STEEL. GIROD TYPE.** Belongs to the class of arc furnaces. One or more electrodes (all of the same polarity) suspended from the top are connected to one terminal of the electric circuit. The current passes from this electrode or these electrodes in form of arcs into the slag, then into the molten steel bath below and then into soft-steel blocks embedded in the bottom of the furnace and water-cooled from the outside. These steel-blocks form the other terminal of the electric circuit and are very durable. Since the carbon electrode at the top does not come into contact with the fused metal, and since the bottom terminal consists of soft-steel, no contamination of the bath is possible.



Special advantages of this furnace are ease of regulation of arc and ease of thorough insulation, due to low voltage. Used in the manufacture of high-speed steels, alloy steels, special steels, and all sorts of steel castings.

—C. W. LEAVITT & Co., New York.

**FURNACES ELECTRIC STEEL. HEROULT TYPE.** Belongs to the class of arc furnaces. With ordinary alternating current there are two electrodes at the top, connected to the two terminals of the electric circuit. The current passes from one electrode in form of an arc into the slag, through the same, and out of it in form of another arc into the other electrode. With three-phase currents three electrodes are used at the top. The slag is at maximum temperature and heats the fused steel bath below, which is in automatic agitation. The product is absolutely homogeneous, as low in sulphur and phosphorus as desired, and thoroughly deoxidized. Perfect de-oxidation is possible on account of the neutral atmosphere and perfect refining is possible by means of the slag which is at the highest temperature. Since the electrodes do not come in contact with the steel bath, no contamination of the bath is possible. The furnace has been adopted by the U. S. Steel Corporation to refine converter steel (for rails) and open-hearth steel (for wire, etc.) and by fifteen other European and American steel works. The Heroult furnace is simple and inexpensive in construction and free from complication and repairs. Basic patents covering electric furnace and process for electric smelting and transfer of molten steel from ordinary furnaces into electric furnaces for thorough purification and refining. See description of the Heroult 15-ton furnace at the South Chicago works of the U. S. Steel Corporation in *Metallurgical and Chemical Engineering*, Vol. VIII, p. 179.

—R. H. WOLFF, New York (representative for U. S.)

—R. TURNBULL, St. Catherines, Ont. (representative for Canada).

**FURNACES, ELECTRIC HARDENING AND ANNEALING STEEL.** For the most efficient heat-treatment of carbon and high-speed steel tools and machine parts. Heat is produced by electrical resistance, the atmosphere of the furnace chamber being *reducing*. Any desired temperature can be obtained accurately, and if so wanted may be readily maintained at such a point. This regulation of temperature is effected by a simple control of the current supplied by the furnace resistor. Either rectangular or cylindrical chamber designs may be had.

—HOSKINS MANUFACTURING COMPANY, DETROIT, MICH.

**FURNACES, ELECTRIC MELTING.** For crucible melting of metals and metallic alloys. Temperature readily controlled, can be raised high enough to melt platinum. Have the decided advantage of being easier on crucibles, so that the same work may be done with a less number of these, than in fuel furnaces operating on a blast.

—HOSKINS MANUFACTURING COMPANY, DETROIT.

**FURNACES, ELECTRIC SMELTING.** With removable tilting hearths, water cooled electrodes, 90% of the carbons being usefully consumed. For reduction smelting of iron ores; for matte smelting of copper ores; for smelting of manganese ores; for smelting of combined lead and zinc, silver ores; for smelting of chrome ores; for smelting of tin ores (one slag only for discard); for melting of iron and steel scrap for steel castings, tools, etc; for making ferro alloys; for making copper alloys.

—MARCUS RUTHENBERG, LONDON.

**FURNACES, ENAMELING.** Electrically operated; absolutely uniform temperature, perfect control, absence of all products of combustion. For jeweler's work of all kinds.

—HOSKINS MANUFACTURING COMPANY, DETROIT.

**FURNACES, ENAMELING.** For granite or agateware, etc. No muffle required. 50 to 80 per cent greater output than ordinary furnaces. High quality.

—W. S. ROCKWELL COMPANY, NEW YORK.

—ROCKWELL FURNACE CO., NEW YORK.

**FURNACES, FORGE.** For all classes of railroad, ship and miscellaneous forging, welding, upsetting, rivet, billet, bulldozer work.

—W. S. ROCKWELL COMPANY, NEW YORK.

—ROCKWELL FURNACE CO., NEW YORK.

—MONARCH ENG. & MFG. CO., BALTIMORE, MD.

**FURNACES, GALVANIZING.** For all classes of work.

—W. S. ROCKWELL COMPANY, NEW YORK.

—ROCKWELL FURNACE CO., NEW YORK.

—MONARCH ENG. & MFG. CO., BALTIMORE, MD.

**FURNACES, HARDENING.** Electrically operated; absolutely uniform temperatures, perfect control, no products of combustion. For tools, dies, springs, cutlery; especially excellent for high-speed steel parts.

—HOSKINS MANUFACTURING COMPANY, DETROIT, MICH.

**FURNACES, HARDENING.** Stationary types. For saws of all kinds, springs, tools, dies, cutters, needles, plow parts, cutlery, automobile and engine parts, high speed tools. All styles and sizes.

—W. S. ROCKWELL COMPANY, NEW YORK.

—ROCKWELL FURNACE CO., NEW YORK.

**FURNACES, HARDENING.** Revolving types. For all small pieces of like dimensions such as steel balls, saw teeth, screws, rings, springs, nuts, caps, cups, punchings, etc. 3 sizes—500, 1,000 and 1,500 pounds capacities per hour. Catalog 2.

—W. S. ROCKWELL COMPANY, NEW YORK.

—ROCKWELL FURNACE CO., NEW YORK.

### **FURNACES, HARDENING.**

—MONARCH ENG. & MFG. CO., BALTIMORE, MD.

**FURNACES, HEATING.** For copper and steel billets, ship plates and angles, bulldozer work, etc.

—W. S. ROCKWELL COMPANY, NEW YORK.

—ROCKWELL FURNACE CO., NEW YORK.

—MONARCH ENG. & MFG. CO., BALTIMORE, MD.

**FURNACES, HEATING ROTARY.** For the rapid, accurate and controllable heating of large quantities of similar objects. Lined with refractory material. It revolves on roller bearings with provision for tilting the furnace at any desired angle to facilitate the forward movement of the contained charge. Any desired temperature may be maintained and the time during which the material treated remains in furnace is adjustable and under perfect control. Oil or gas fuel may be used.

—ROCKWELL FURNACE CO., NEW YORK.

**FURNACES, JAPANING.** For all classes of work

—W. S. ROCKWELL COMPANY, NEW YORK.

—ROCKWELL FURNACE CO., NEW YORK.

—MONARCH ENG. & MFG. CO., BALTIMORE, MD.

**FURNACE LININGS.** See Linings.

**FURNACES, MELTING.** Electrically operated; for crucible melting of metals and metallic alloys. Temperature readily controlled, can be raised above the melting point of platinum. Chamber atmosphere is reducing, effecting a large saving of crucibles in foundry work. Of marked advantage for use by metallurgists, manufacturing jewelers and chemists.

—HOSKINS MANUFACTURING COMPANY, DETROIT, MICH.

**FURNACE, MELTING. CRUCIBLE TILTING. STEEL-HARVEY.** Constructed to operate entirely above ground; fuel for melting oil or gas and air; crucibles of various sizes are retained within the furnace while pouring the metal. The cover is arranged to tilt with the furnace or to swing aside as may be desired. Combustion chamber so arranged for holding heat at the bottom. Burner adjusted so that the benefit of free air is retained, fuel consumption is reduced, metal is melted as rapidly as consistent, avoiding loss by overheating or oxidation. Output of one furnace equivalent to three old-style furnaces; labor reduced, cost of melting reduced one-half, operated with high or low air pressure, results a saving of 50% in cost of melting metal and can melt any class of metal desired, especially arranged for cyanide precipitates of gold and silver, or miscellaneous ores, nickel, cobalt, brass, bronze, aluminium iron, ferro-alloys, etc. Guaranteed high economy and efficiency.

—MONARCH ENGINEERING & MFG. CO., BALTIMORE, MD.

**FURNACE, MELTING. LIFT-OUT CRUCIBLE.** For making special alloys. melting precious metals, analytical work, light castings, etc. It is compact and the heat is under absolute control of operator. An air blast of from 2 to 5 pounds is adequate, which may be supplied by small positive blower. Oil or gas fuel may be used.

—ROCKWELL FURNACE CO., NEW YORK.

**FURNACE, MELTING. SIMPLEX.** For brass, bronze, copper, grey iron, etc. Made with horizontal cylindrical shell, resting on cast iron stands and revolves on roller bearings. The lining may be carborundum, ganister, fire brick, or other suitable material. No crucibles are used. Some of the advantages are low first cost, quick heats, little floor space, small fuel consumption. Oil of gas fuel may be used.

—ROCKWELL FURNACE CO., NEW YORK.

**FURNACES, MELTING. STATIONARY TYPES.** For brass, copper, bronze, gold, silver, aluminium, etc. Built above or below floor level. Sliding or swinging covers. Simple tile lining. Best stationary furnace made. In use United States, Canadian and Mexican mints. Sizes suitable for all crucibles.

—ROCKWELL FURNACE CO., NEW YORK.

**FURNACE, MELTING. TILTING CRUCIBLE.** For melting aluminium, brass, copper, steel, manganese, etc. The crucible is not removed from the furnace chamber, the metal being transferred to ladle by tilting the entire furnace. A fan blast of 12 oz. pressure is sufficient for air supply and as the burner is placed at top of furnace and flame directed against bottom of the chamber, the crucible is not subjected to uneven temperature. Some of the advantages of this furnace are cleanliness, quick heats, little noise, long life of crucible and no metal to run on floor if crucible breaks.

—ROCKWELL FURNACE CO., NEW YORK.

**FURNACES, MELTING. STATIONARY TYPES.** For brass, copper, bronze, gold, silver, aluminium, etc. Built above or below floor level. Sliding or swinging covers. Simple tile lining. Best stationary furnace made. In use United States, Canadian and Mexican mints. Sizes suitable for all crucibles.

—W. S. ROCKWELL COMPANY, NEW YORK.

**FURNACES, MELTING. Tilting.** For brass, copper, bronze, gold, silver, aluminium, steel additions, etc. Metal always clean. Castings sound and strong. Lowest possible shrinkage. Cover tilts with furnace. Fire may be continued while pouring. Cover on also. Crucible lasts longer than in any other furnace. Always hot at bottom. Simple and inexpensive tile lining. Costs little. Melts much. 4 sizes—200, 400, 800 and 1,600 pounds capacities. Oil or gas fuel. Catalog 4.

—W. S. ROCKWELL COMPANY, NEW YORK.

**FURNACES, MINT.** Electrically operated, clean (no products of combustion), compact, necessary temperatures easily maintained constant. The form in which the heat is supplied (by electrical resistance heating) makes these furnaces especially valuable in melting of the precious metals.

—HOSKINS MANUFACTURING COMPANY, DETROIT, MICH.

**FURNACES, MINT.** For melting, cupelling, gold boiling, annealing, sweep reducing, refining, die hardening, tool dressing, etc. In use United States, Canadian and Mexican Mints.

—W. S. ROCKWELL COMPANY, NEW YORK.

**FURNACES, MINT.**

—MONARCH ENG. & MFG. CO., BALTIMORE, MN.

**FURNACES, MINT, CRUCIBLE.** Used in mint work and in making fine bars and anodes. These furnaces have hoods with sliding doors and have flues for withdrawing the fumes. Very economical, can be operated by oil or gas fuel.

—ROCKWELL FURNACE CO., NEW YORK.

**FURNACES, MUFFLE.** A combined crucible and muffle furnace especially adapted for assay work. Operated with coal gas, natural gas, gasoline gas, or kerosene oil, with forced air blast by means of a foot or power blower. Also plain draft muffle furnaces which require no air blast, operated with coal gas, natural gas, or gasoline gas, with range of temperatures up to 2400° F. Write for Catalog B.

—BUFFALO DENTAL MFG. CO., BUFFALO, N. Y.

**FURNACES, MUFFLE.** Electrically operated; built in different sizes, and in different designs for various temperature ranges. For assaying, cupelling, enameling and heat-treating of steels.

—HOSKINS MANUFACTURING COMPANY, DETROIT, MICH.

**FURNACES, MUFFLE.** For assaying, scorifying and cupelling. This is a rapid furnace. The retort can be heated in fifteen minutes and sixteen assays of silver have been taken out in twenty-two minutes.

—ROCKWELL FURNACE CO., NEW YORK.

**FURNACES, MUFFLE.** For all purposes including enameling, cupelling, etc. All sizes.

—W. S. ROCKWELL COMPANY, NEW YORK.

—MONARCH ENG. & MFG. CO., BALTIMORE, MD.

**FURNACES, OPEN-HEARTH.**

—MONARCH ENG. & MFG. CO., BALTIMORE, MD.

**FURNACES, REFINING.** For copper, gold, silver and other metals. All types and sizes.

—W. S. ROCKWELL COMPANY, NEW YORK.

**FURNACES, REFINING.** For copper, gold, silver, and other metals. All types and sizes.

—ROCKWELL FURNACE CO., NEW YORK.

—MONARCH ENG. & MFG. CO., BALTIMORE, MD.

**FURNACES, REGENERATIVE.** Built for producer gas, natural gas or oil fuel, for the economical and uniform heating of billets, ingots, steel melting, scrap melting, brass melting, etc. Usually designed and built to meet special requirements.

—ROCKWELL FURNACE CO., NEW YORK.

**FURNACES, RETORT.** For gold and silver mills.

—COLORADO IRON WORKS CO., DENVER, COLO.

**FURNACES, REVERBERATORY.** Roasting and smelting. Using petroleum, gas, or solid fuel.

—COLORADO IRON WORKS CO., DENVER, COLO.

**FURNACES, REVERBERATORY.** For melting quantities of brass and copper scrap. For refining copper. For granite or agate ware enamel mixtures and other purposes. All capacities.

—W. S. ROCKWELL COMPANY, NEW YORK.

**FURNACE, REVERBERATORY.** Melting and Cupelling. For reducing by-products in electrolytic refineries, mints and jewelry establishments. This furnace is water-jacketed, insuring comfort to the workman and preserves the life of lining. Oil or gas fuel may be used.

—ROCKWELL FURNACE CO., NEW YORK.

**FURNACES, REVERBERATORY.**

—MONARCH ENG. & MFG. CO., BALTIMORE, MD.

**FURNACES, RIVET.** Portable and stationary types. Portable forges for railroad, bridge and ship work. Stationary forges for car, boiler and other shop work.

—W. S. ROCKWELL COMPANY, NEW YORK.

—ROCKWELL FURNACE CO., NEW YORK.

—MONARCH ENG. & MFG. CO., BALTIMORE, MD.

**FURNACE, ROASTING.** McDougall. Simple, economical, and practical. Low cost of installation and maintenance. For roasting all classes of ore, especially where external heat is required. Uses wood, coal, oil, or gas for fuel. Discharges from 30 to 100 tons of "Sweet" roasted product per day, depending upon the nature of the ores. A maximum capacity per square foot of hearth area with minimum fuel.

—ALLIS-CHALMERS CO., MILWAUKEE, WIS.

**FURNACES, ROASTING.** For sulphide and arsenical ores, etc. Reverberatory hand-roasting furnaces. Mechanical roasting furnaces.

—COLORADO IRON WORKS CO., DENVER, COLO.

**FURNACES, ROASTING.** Mechanical. For the roasting of pyrites, pyrrhotite and sulphide ores, etc., in size and capacity up to 34 feet diameter and with any number of hearths desired. Hearths can be muffled if the roasting problem makes it desirable. Concentrate containing as low as 13.6 sulphur has been successfully desulphurized down to 2.26 per cent sulphur without the use of fuel. Write for catalogue and Bulletin "B."

—PENNSYLVANIA SALT MFG. CO., PHILADELPHIA, PA.

**FURNACES, SINGEING.** For cotton goods, single or multiple plates. In use throughout United States

—W. S. ROCKWELL COMPANY, NEW YORK.

**FURNACES, SINGEING.**

—MONARCH ENG. & MFG. CO., BALTIMORE, MD.

**FURNACES, SMELTING.** For copper, lead, etc., ores. Improved and reliable furnaces, combining simplicity and durability of construction to attain simplicity of operation and highest efficiency.

—ALLIS-CHALMERS CO., MILWAUKEE, WIS.

**FURNACES, SMELTING.** Blast furnaces for smelting copper, lead, silver and gold ores. Pioneers in the building of such furnaces, the designs meeting the most exacting requirements. Also builders of reverberatory smelting furnaces. See Catalog 12.

—COLORADO IRON WORKS CO., DENVER, COLO.

**FURNACES, SOFT-METAL.** Lead, tin, babbitt, and other pot melting. For every purpose. All styles and sizes

—W. S. ROCKWELL COMPANY, NEW YORK.

—ROCKWELL FURNACE CO., NEW YORK.

—MONARCH ENG. & MFG. CO., BALTIMORE, MD.

**FURNACE, STATIONARY.** Single or double compartment arranged for various capacities, heated with oil or gas and air. Very efficient, and save 50% over old style methods.

—MONARCH ENGINEERING & MFG. CO., BALTIMORE, MD.

**FURNACES, SULPHUR.** For sectional view see Manufacturers' Catalog 7-S. Advantages:—Simple manipulation, no escape of sulphurous acid fumes, continuous working, burning sulphur visible from outside. Easy cleaning. Greatest efficiency. At least 95% of sulphur burned. Arranged for suction as well as compressed air. Sulphur is fed to the pans by means of hoppers, holding sufficient quantity for a number of hours' run. Easy lighting facilities. Perfect combustion and low temperature maintained by means of water-cooled chamber.

—SCHUTTE & KOERTING CO., PHILADELPHIA, PA.

**FURNACES, TEMPERING.** Rotary type. See Hardening Furnaces.

—ROCKWELL FURNACE CO., NEW YORK.

**FURNACES, TEMPERING.** Stationary types. For all classes of work, either by direct heat or by lead, sand, or oil bath. All sizes.

—ROCKWELL FURNACE CO., NEW YORK.

**FURNACES, TEMPERING.** Rotary types. See Hardening Furnaces.

—W. S. ROCKWELL COMPANY, NEW YORK.

**FURNACES, TEMPERING.** Stationary types. For all classes of work, either by direct heat or by lead, sand or oil bath. All sizes.

—W. S. ROCKWELL COMPANY, NEW YORK.

**FURNACES, TEMPERING.**

—MONARCH ENG. & MFG. CO., BALTIMORE, MD.

**FURNACES, TINNING.** For wire, tubing or sheets. All styles and sizes.

—W. S. ROCKWELL COMPANY, NEW YORK.

**FURNACES, TINNING.**

—MONARCH ENG. & MFG. CO., BALTIMORE, MD.

**FURNACES.** Smaller size. Such as specially designed for experimental work or for use in the laboratory, are described in the second part of this Dictionary, devoted to Measuring Instruments and Laboratory Supply.

**FURNACES, TINNING.** For wire, tubing or sheets. All styles and sizes.

—ROCKWELL FURNACE CO., NEW YORK.

**FURNACE BLOWERS.** See Blowers, Piqua Positive.

**FURNACE LININGS.** See Bauxite, Carbon, Carborundum, Chrome Brick, Chrome Ore, Fire Brick, Graphite, Magnesite Brick, Magnesite, Silica Brick.

**GALVANIZING.** See Electro galvanizing.

**GANNISTER.**

—THE ASHLAND FIRE BRICK CO., ASHLAND, KY.

**GAS ENGINES.** Producer gas, furnace gas, natural gas. Economy guaranteed from the coal pile to the switchboard. The largest builder of gas engines in the world, furnishing complete gas power plant equipments including generators of its own design, and installing in connection with the engines, producers of the type best adapted to the conditions.

—ALLIS-CHALMERS CO., MILWAUKEE, WIS.



**GAS ENGINE—WESTINGHOUSE.** Four-stroke cycle. Natural, artificial or producer gas. Horizontal double-acting type is used for capacities of 300 h.p. and upwards. Large gas engines are designed for use with blast-furnace gas as well as for producer and natural gases, and are built twin-tandem up to 4000 h.p. units or larger. Close regulation for direct connection to electric generators. Small gas engines for general power purposes are vertical single acting, and usually 2 or 3 cylinder. Can be used to advantage on natural or artificial gas, also with producer gas or other fuels. Various capacities regularly carried in stock.

—WESTINGHOUSE MACHINE Co., PITTSBURGH, PA.

**GAS-LINE MATERIAL ATWOOD.** Complete piping systems, valves, regulators, etc., for natural gas. Standard lines for working pressures of 200, 400, and 1000 lbs. per sq. in. Designs submitted for higher pressures and special work. All-iron valves and lead recessed fittings.

—PITTSBURGH VALVE, FOUNDRY & CONSTRUCTION Co., PITTSBURGH, PA.

**GAS PRODUCER.** See Producer.

**GAS PRODUCER BLOWERS.** See Blowers, Piqua Positive.

**GAS-PRODUCER LININGS.** See Linings.

**GAS SCRUBBERS.** See Gas Washers.

**GAS VALVE.** See Valve.

**GAS WASHER.** *A machine of suitable construction for washing the gases from smelting furnaces, chemical plants, etc., so as to dissolve as large an amount of the gases as possible, and thus purify the escaping gases.*

**GAS WASHER, OSBORNE.** Will collect the gases from chemical plants, etc., and wash the same so that practically all of the soluble gases will be reduced to solution. This is accomplished by drawing the gases through a fan of suitable size and discharging them into a water spray machine, where the gases are brought into contact with finely divided sprays of water. These machines are also provided with paddles which beat the gases, thereby causing all the particles to be brought into contact with the moisture and effecting a thorough washing of the same. These machines are especially valuable for washing gases from copper and brass smelting furnaces where the sulphurous oxides are usually a source of great annoyance. By the use of these machines the sulphur oxides will be reduced to a weak solution of sulphuric acid.

—GRISCOM SPENCER Co., NEW YORK.

(See also Dust Collector, Smoke Consumer, Vapor Condenser.)

**GASKETS, RUBBER.** Any size or shape. Either pure rubber or with cloth, wire or sheet metal insertion. Made to order at short notice; to withstand all conditions of service.  
—BOSTON BELTING COMPANY, BOSTON.

**GASKETS, RUBBER.** Made of pure rubber, or with cloth or wire insertion. The Eastern, New York, or Western shapes carried in stock, any other style or shape on short notice. In ordering, send template when possible; otherwise give inside measurements and width of flange and thickness desired. Gaskets and rings also made of Black Hawk, Usuduriao, Giant Red Crescent, Black Cross.  
—REVERE RUBBER CO., BOSTON, MASS.

**GEARING.**

—SCAIFE FOUNDRY AND MACHINE CO., LTD., PITTSBURGH, PA.

**GEARS.**

—MACKINTOSH, HEMPHILL & CO., PITTSBURGH, PA.

**GENERATORS.** Electroplating and electrolytic. See also Motor Generators.

**GENERATORS, ELECTRIC.** Alternating Current and Direct Current.

—ALLIS-CHALMERS CO., MILWAUKEE, WIS.

**GENERATORS.** Electric. Westinghouse alternating and direct current of all capacities for every purpose and all types of prime movers.

—WESTINGHOUSE ELECTRIC & MFG. CO., PITTSBURGH, PA.

**GENERATORS, ELECTRIC SMELTING.** Special design for use with electric furnaces, 100 to 3000 kw.

—MARCUS RUTHENBERG, LONDON.

**GENERATORS, ELECTROLYTIC.** Giving low voltage for electrotyping, electroplating, and electrochemical processes in general, manufactured in twelve sizes, 60 to 500 amperes, 5 to 6 volts are of the bipolar type. Above 500 amperes they are multi-polar 4 to 14 poles. Also builders of a 16-pole machine giving 10,000 amperes at 6 volts. The machines are solidly constructed well ventilated and of up-to-date design. In multi-polar types they have two commutators with large brush surface. Wound for single, double and three voltages arranged for two or three-wire systems, also wound for special voltages for experimental work. Machines fitted with copper gauze or carbon brushes.

—CHAS. J. BOGUE ELECTRIC CO., NEW YORK.

**GENERATORS, ELECTROPLATING.** Low-voltage dynamos for electroplating purposes in various sizes ranging from 100 to 5000

amperes on the three-wire system, also dynamos from 50 to 10,000 amperes on two-wire system.

—HANSON & VAN WINKLE COMPANY, NEWARK, N. J.

**GENERATORS, ELECTROPLATING.** Low-voltage, shunt-wound standard machines wound for 5 or 6 volts, in eleven different sizes to give a current from 50 to 3000 amperes. Larger and special machines for all purposes built to order, with capacities from 50 to 12,500 amperes.

—ZUCKER & LEVETT & LOEB CO., NEW YORK.

**GERMAN SILVER WIRE.** See Wire.

**GLUE POT HEATERS,** Dopp. Consist of a one-gallon cast-iron seamless steam-jacketed pot with flat bottom and stand on three permanent legs. The water in the pot is heated by the steam in the jacket, and the glue pail is placed in the water. The jackets of the pots have an outlet at the bottom for the drip and are tested to one hundred pounds hydrostatic pressure. They are largely used in furniture and other woodworking factories and are very practical. By means of suitable piping, a long line of these pots can be set up, so that each workman has his own equipment right at his bench.

—SOWERS MFG. CO., BUFFALO, N. Y.

**GRAPHITE.** By proper selection of raw materials, graphites of widely different characteristics are produced in the electric furnace. This obviates the necessity of "doping" the graphite to impart certain properties for special purposes, a practice sure to result in loss of other valuable qualities. Hence the increasing popularity of electrically-produced graphites for such purposes as dry-battery filler, paint pigment for steel and iron, electrotyping leads, lubrication, either dry or mixed with oil or grease, powder glazing, pipe-joint compound, furnace lining, lamp-filament paste, stove polish, lead pencils, recarbonizing steel, and all electrical purposes.

—INTERNATIONAL ACHESON GRAPHITE CO., NIAGARA FALLS, N. Y.

**GRATE TILE.** See Tile.

**GRAY-IRON FURNACE BLOWERS.** See Blowers, Piqua Positive.

**GREDAG.** A combination lubricant of unexcelled merit made by blending unctuous, pure, soft Acheson graphite with a high grade grease. The graphite used in making gredag is an electric-furnace product and has a guaranteed purity of at least 99%. It is, therefore, without the dangerous grit and other impurities usually found associated with graphite greases in which natural graphite is incorporated. Because the Acheson graphite incorporated in gredag forms the body of the lubricant, it is possible to employ a grease of very low viscosity as a carrier, thus effecting a valuable saving in power to those who use it, while it is a fact that either grade of gredag

will serve for a wider range of uses than plain grease lubricants. The grades and consistencies in which gredag is available are: No. 31, semi-fluid, especially adapted for enclosed transmissions of automobiles, etc.; No. 32, soft, for transmissions and general automobile use, etc.; No. 33, medium, for general automobile use; No. 51, semi-fluid, for use on engines and high-grade machinery, can be used in squirt cans; No. 52, soft, for cup and general use; No. 53, medium for cup and general use; this grade will successfully replace harder greases, owing to its great lubricating value; No. 63, medium, of fibrous or spongy nature. For general use.

—INTERNATIONAL ACHESON GRAPHITE COMPANY, NIAGARA FALLS, N. Y.

**GRINDING.** See Crushing and Grinding.

**GRIZZLEYS.** Ore.

—COLORADO IRON WORKS CO., DENVER, COLO.

**HAMMER CRUSHER.** See Crushing and Grinding.

**HARDENING FURNACE.** See Furnace, Hardening.

**HARDENING FURNACE BLOWERS.** See Blowers, Piqua Positive.

**HARD RUBBER ARTICLES.** Acid pumps, piping and fittings for conveying acids, alkalies, corrosive liquors, dyes, brine, etc. Also hard rubber cocks, buckets, measures, acid bottles, tanks dipping baskets, funnels, etc.

—AMERICAN HARD RUBBER CO., NEW YORK.

**HARDINGE CONICAL MILL.** See Crushing and Grinding, conical mill.

**HEATERS, PORTABLE, MONARCH.** For heating foundry ladles, firing up the cupolas, drying of molds, heater arranged on portable trucks, fully equipped with sectional hose, oil tanks, burners etc.

—MONARCH ENGINEERING & MFG. CO., BALTIMORE, MD.

**HEATERS, REILLY MULTICOIL, FOR LIQUIDS.** These are of tubular type, the heating surface being copper tubes coiled to a small radius, through which the liquid to be heated is passed. Each tube is attached by ground union joints, and all are accessible through a man-hole door in the shell of the heater. The construction is extremely efficient, giving the highest possible terminal temperatures; and presents peculiar advantages for cleaning the interior of shell or tubes, in case there should be an accumulation of sediment, and for the renewal of the heating surface in case of corrosion. The heaters are therefore especially adapted for chemical purposes of all kinds.

—THE GRISCOM-SPENCER CO., NEW YORK.

**HEATERS.** For Heating Liquids by direct steam. The Koerting "noiseless heater" is made of lead, iron, brass, etc., and can be used for heating up various liquids where diluting is not objectionable. The apparatus is in the form of an inverted cone, one of the discs or cones being perforated and the other plain. It will heat the liquid to any desired temperature, according to steam pressure, and at the same time gives powerful agitating effect. The disturbing noises and destructive effect on open tanks (as for instance, when steam is introduced through perforated pipes) is entirely obviated by attaching the noiseless heater to the end of steam pipe. Catalog HH-3.

—SCHUTTE & KOERTING CO., PHILADELPHIA, PA.

**HEATERS.** A form of surface condenser for utilizing the heat from exhaust steam to raise the temperature of dilute or concentrated liquors. Designed primarily for heating the liquor, they contain a suitable amount of tubular heating surface so arranged as to get the liquor at a maximum temperature. Construction entirely dependent upon the nature of the liquor and other conditions. We are prepared to build heaters of any capacity and where used in connection with evaporators, the saving in fuel is considerable besides relieving the evaporator of this work and so increasing its capacity.

—SWENSON EVAPORATOR CO., CHICAGO, ILL. (Formerly American Foundry & Machinery Co.)

**HEATERS.** For heating liquors of all kinds by exhaust steam, or by use of other sources of heat, as vapor, condensation water, etc. Ordinarily consists of a cylindrical shell, fitted with tubular heating surface. No stock apparatus is used, but heaters are designed expressly to suit the conditions encountered. Their use produces a pronounced saving in fuel, which is often secured from the most unpromising sources. On receipt of data covering conditions, we will be pleased to advise in regard to possible economies.

—ZAREMEA COMPANY, BUFFALO, N. Y.

**HEATING COILS.** See Coils.

**HEATING FURNACE.** See Furnace, Heating.

**HEATING FURNACE BLOWERS.** See Blowers, Piqua Positive.

**HOISTING ENGINES** and hoisting machinery. Steam and electric.

—ALLIS-CHALMERS CO., MILWAUKEE, WIS.

**HOISTS,** Electric, pneumatic and hand power. Furnace hoists.

—THE BROWN HOISTING MACHINERY CO., CLEVELAND, OHIO.

**HOISTS.** Electric overhead travelling hoists of mono-rail or other types for hoisting and conveying material of all kinds. Have

enclosed gearing and are made for any current. Also electric platform hoists for general work. Bulletin 21. Pneumatic cylinder hoists for light work and short lifts. Bulletin 34.

—NORTHERN ENGINEERING WORKS, DETROIT, MICH.

**HOSE.** Of rubber; or cotton, rubber-lined; or linen, unlined; for acids, air, chemicals, fire protection, gas, oil, pneumatic tools steam, suction, vacuum, water, etc. Unsurpassed facilities for the prompt production of any kind of hose for any specific purpose, Forsyth braided hose for many uses is a particularly meritorious article, combining flexibility, great strength, and lightness to a remarkable degree.

—BOSTON BELTING COMPANY, BOSTON, MASS.

**HOSE.** Revere acid hose. For conducting the various acids used in chemical factories, sulphite plants, die works, print works, galvanizing works, tanneries, laboratories, etc. This hose has an unusually heavy lining of fine Para rubber. The uniformity of Revere construction obviates any defects that invariably cause the destruction of the fabric in the old style hose. The continuous length feature disposes of unnecessary couplings that are usually affected by acids. Revere hose may be recommended for the most trying conditions.

—REVERE RUBBER CO., BOSTON, MASS.

**HOSE, OIL.** For unloading tank cars. Has car and pipe couplings. Standard length 6 ft. Internal diameter 2 in. Spiral lined. Larger sizes made to order. Catalog 3.

—W. S. ROCKWELL COMPANY, NEW YORK.

#### **HOSE, OIL.**

—MONARCH ENG. & MFG. CO., BALTIMORE, MD.

**HOT-BLAST SMELTING.** Of gold, silver, copper and lead ores. Catalog "Some details as to smelting practice and equipments."

—COLORADO IRON WORKS CO., DENVER, COLO.

**HOT BLAST SMELTING BLOWERS.** See Blowers, Piqua Positive.

**HOT-BLAST STOVE, AMSLER.** A three-pass central-combustion-chamber stove with concentric passes, of the Massicks & Crooke type. The construction requires fewer special brick shapes than other stoves of this kind. All walls have provision for independent expansion and contraction, so that the repairs are reduced to practically nothing. The heating surface is unusually large and the draught is equalized so that there is no trouble with hot sides.

—WALTER O. AMSLER, PITTSBURGH, PA.

**HOT-BLAST STOVES.** U-pipe hot-blast stoves for heating blast in pyritic smelting.

—COLORADO IRON WORKS CO., DENVER, COLO.

**HUMPHREY CRUSHING ROLLS.** See Crushing and Grinding, Rolls.

**HYDROCHLORIC ACID CONDENSING PLANTS** of all capacities.

—DIDIER-MARCH Co., New York.

(Other stoneware makers see Stoneware.)

**HYDROFLUORIC ACID.**

—FURST BROS. & Co., New York.

—THE BAKER & ADAMSON CHEMICAL Co., Easton, Pa.

**HYDROGEN** generation. See Hydrene.

**HYDRONE.** A sodium-lead alloy, which upon contact with water furnishes 100% pure hydrogen gas (free from arsenic). One pound hydrone yields 2.6 cu. ft. hydrogen gas. By increasing the sodium percentage of the alloy, a higher yield of gas can be obtained, which is, however, too inflammable for ordinary uses.

—ROESSLER & HASSLACHER CHEMICAL Co., New York.

**HYPOCHLORITE.** See Bleaching liquor.

**IMPACT SCREEN.** See Screen, Impact.

**INCANDESCENT FILAMENT BLOCKS.** Blocks and forms of any desired shape can be readily machined from solid Acheson-Graphite rods or slabs. 99% pure graphitic carbon, without bond. Free from volatile or fusible matter. All shapes made to special order without moulds.

—INTERNATIONAL ACHESON GRAPHITE COMPANY, NIAGARA FALLS, N. Y.

**INGOT IRON.** See American ingot iron.

—AMERICAN ROLLING MILL Co., MIDDLETOWN, OHIO.

**INJECTORS.** Made of acid-proof stoneware, and accurately ground, in various sizes and styles, to be operated either by steam or air, for moving liquids or gases.

—DIDIER-MARCH COMPANY, New York.

(Other stoneware makers see Stoneware.)

**INJECTORS.** Of stoneware. To increase the draught in condensing and regenerating plants.

—J. W. SITTING, New York.

**INTENSIFIERS.**

—MACKINTOSH, HEMPHILL & Co., PITTSBURGH, PA.

**IRON, ENAMELED.** See Enameled Ware of Iron.

**IRON, non-corrosive, pure.** See American ingot iron.

—AMERICAN ROLLING MILL Co., MIDDLETOWN, OHIO.

**IRON GOODS.** Plain Cast Iron and Enameled. Kettles, stills, vacuum pans, tanks, etc. Special goods to order.

—STUART & PETERSON CO., BURLINGTON, N. J.

**IRON ORE WASHERS.** Scaife patent automatic trough washer. Surface ores can in this washer not only be relieved of clay more economically than in log washers, but where properly sized can be separated from the rock which usually accompanies them. See under Washers.

—SCAIFE FOUNDRY AND MACHINE CO., LTD., PITTSBURGH, PA.

**IRON SULPHATE.** Copperas.

—PENNSYLVANIA SALT MFG. CO., PHILADELPHIA, PA.

**IRON SULPHIDE,** true nitrate, copperas nitrate or iron and copperas.

—GENERAL CHEMICAL CO., NEW YORK CITY.

**IRON AND STEEL WORKS MACHINERY AND CASTINGS.**

—SCAIFE FOUNDRY AND MACHINE CO., LTD., PITTSBURGH, PA.

**JAPANNING FURNACES.** See Furnaces, Japanning.

**JAR MILL.** See Crushing and Grindng, Jar Mill.

**JAW ROCK CRUSHERS.** See Crushing and Grinding. Crushers.

**JIG.** Allis-Chalmers Hancock. A jig with a reciprocating motion of sieve. Handles all kinds of concentrating ores. No sizing trommels required. Handles unsized product ranging from  $\frac{1}{8}$ -inch to finest size profitably jigged. Large capacity, 400 to 700 tons of ore per day. Uses one half the water required by Hartz jigs.

—ALLIS-CHALMERS CO., MILWAUKEE, WIS.

**JIG, Hartz.** Of improved design. Hancock jig. Especially suited to very large capacities, a single machine handling from 200 up to 600 or 700 tons per day. Will handle an unsized product ranging from five-eighths to one-eighth inch in one machine, on a consumption of one-half the water required by the Hartz jig or even less.

—COLORADO IRON WORKS CO., DENVER, COLO.

**JOINTS.** See Welding; Oxy-acetylene, Welding, Thermit; Connectors; Expansion Joints.

**JUGS, ACID.** Of acid-proof stoneware, cylindrical or conical shape or jug shape with and without handles, large and small capacities.

—DIDIER-MARCH CO., NEW YORK.

(Other stoneware makers see Stoneware.)



**KETTLES.** Steam-jacketed kettles made of copper and silver, also of lead, silver, and tin-lined copper. These kettles may be used for heating, cooking, and evaporating many products such as confectionary and varnishes, and a large variety of chemical and food products. Standard kettles are tested to 150 pounds cold water pressure and are guaranteed to be of high grade of workmanship. This form also makes a specialty of all sorts of mixing and tipping kettles which are designed to suit particular requirements. Silver and lead-lined kettles which are just as good as far as resistance to chemical action goes, as kettles made of pure silver or lead, and yet are very much cheaper and have the strength and durability of the copper kettle, are one of the specialties.

—E. B. BADGER & SONS CO., BOSTON, MASS.

**KETTLES, mixing.** Steam-jacketed or fire-heated mixing kettles made of copper, silver and lined copper in all sizes from 20 gallons, upward. Such kettles are furnished with mixing and tipping arrangements to suit the product to be manufactured, mixers being of various shapes and designs, over- or under-driven as desired.

—E. B. BADGER & SONS, BOSTON, MASS.

**KETTLES.** Of all kinds.

—BAEUEERLE & MORRIS, PHILADELPHIA, PA.

**KETTLES.** Day's improved steam jacketed kettle is strong and heavily made of steel plate, with a two-inch steam space all around. It is provided with an improved cock for kettle outlet, safety valve, inlet and outlet for steam and mounted on removable iron legs. Made with a capacity of 50 to 500 gallons.

—J. H. DAY CO., CINCINNATI, OHIO.

**KETTLES.** For boiling, made of acid-proof stoneware, in various sizes and shapes, with flanged rims and socket rim.

—DIDIER-MARCH COMPANY, NEW YORK.

(Other stoneware makers see Stoneware.)

**KETTLES.** Steam-jacketed. Made of copper in all sizes from 25 gallons upward, with block tin lining, if desired. Mixer operated by belt, either single or double acting, and with scrapers to prevent the contents from burning. The steam jackets are tested to 125 lbs. hydrostatic pressure.

—F. J. STOKES MACHINE COMPANY, PHILADELPHIA, PA.

**KETTLES.** Steam-jacketed kettles in sizes from 10 to 500 gallons capacity. Types Argus, Baronet, Coronet, Duke, Exeter, Ferncliff, Grecian, Herald, Hercules, Juniata, Keystone, Lorain, Melrose, Nevada, Oneida, Puritan, Quebec, Samson, for different purposes. Particulars on request. Steam-jacketed kettles with mixers.

—STUART & PETERSON CO., BURLINGTON, N. J.

**KETTLES, SEAMLESS STEAM-JACKETED, DOPP.** (See illustration, Electrochemical & Metallurgical Industry, May issue, 1909)

advertising page 37.) Each is a piece of metal formed in a mold, without seams, rivets or bolts. The inside surface is very hard and smooth. The steam jackets are tested to 150 lbs. hydrostatic pressure. This type of kettle is very durable and more resistant to chemical action than wrought iron or steel. They are used for heating, boiling, evaporating, cooking, (also for cooling) a great variety of chemicals, food products, and technical products in general. They are supported on removable legs or on lugs in the case of the larger sizes.

—SOWERS MFG. CO., BUFFALO, N. Y.

**KETTLES, STEEL ENAMELED.** Acid and alkali-proof steam-jacketed kettles. Made of plate steel and coated with an enamel that is absolutely acid and alkali-proof. All seams are welded and there are no riveted, bolted or packed joints. From 50 to 800 gallons capacity.

—THE ENAMELED PIPE & ENGINEERING CO., ELYRIA, OHIO.

**KNEADING MACHINERY.** See Mixers and Mixing Machines.

**KOSTICO.** A dry granular salt used in making a solution for removing grease and cleaning work in all plating operations. Makes a clear solution and has no surface scum to cling to the work.

—HANSON & VAN WINKLE COMPANY, NEWARK, N. J.

**KRUPP MILL.** See Crushing and Grinding.

**KRYOLITE.** Pure ground, from Greenland. For glass makers, hollow-ware manufacturers, and enamellers.

—PENNSYLVANIA SALT MFG. CO., PHILADELPHIA, PA.

**LACQUERS.** All grades for all purposes, both dip and brush lacquers. All colors, bright and dull blacks. Also the finest gold colors for use on brass.

—HANSON & VAN WINKLE COMPANY, NEWARK, N. J.

**LADLE LININGS.** See Linings.

**LADLES.** Geared foundry ladles, for capacities from 2000 to 60,000 lbs. Of strongest construction, with a very large factor of safety employed in all parts. The standard gearing on all sizes is an improved worm or screw gear, with the operating wheel carried well out to the side, where the operator can oversee his pouring. Absolutely self-locking at every point. There is no jerking or unsteady motion in tipping. We also build spur-gearled ladles for rapid pouring as in pipe foundries; also bottom tap ladles; truck ladles; reservoir ladles, etc. Bulletin No. 62.

—NORTHERN ENGINEERING WORKS, DETROIT, MICH.

**LAMPS.** Arc. Westinghouse arc lamps. Mill-type lamps specially designed to withstand the jarring of heavy mill machinery.

—WESTINGHOUSE ELECTRIC & MFG. CO., PITTSBURGH, PA.

**LAMPS, BLAST.** Separately operated on gasoline, supplying its own pressure. Heat may be quickly regulated from that of a blast burner down to that of the smallest Bunsen flame.

—HOSEINS MANUFACTURING COMPANY, DETROIT, MICH.

**LAMPS, INCANDESCENT.** Westinghouse. For lighting mills and industrial plants.

—WESTINGHOUSE ELECTRIC & MFG. CO., PITTSBURGH, PA.

**LAMPS.** Metallic-Filament. See Metallic-Filament Manufacture.

**LAMPS, METALLIC FLAME ARC.** Westinghouse. For outdoor illumination about mills, furnaces and industrial plants.

—WESTINGHOUSE ELECTRIC & MFG. CO., PITTSBURGH, PA.

**LAMP-FILAMENT PASTE.** For securing the filaments of incandescent lamps to their leads and anchors a paste using pure Acheson graphite as a base has proven remarkably successful. Grades " 1310 " and " 1340 " as applied to this purpose are practically chemically pure, free from metallic oxides, contain no volatile matter, are ground extremely fine, and are excellent electrical conductors.

—INTERNATIONAL ACHESON GRAPHITE CO., NIAGARA FALLS, N. Y.

**LANTERNS.** Of acid-proof stoneware, for observing and regulating the flow of gases in towers. These lanterns are provided with a perforated grate plate, the holes of which are closed by little balls. The draught can be regulated from the outside by moving the balls away to the side.

—DIDIER-MARCH COMPANY, NEW YORK.

**LANTERNS.** Made of the very best clay material and covered with acid-proof glazing in order that the liquid condensation can go on uninterruptedly. The slots in which the panes of glass are inserted should be of proper construction to insure a proper fit.

—U. S. STONEWARE CO., AERON, OHIO.

**LATHE, POLISHING AND BUFFING LATHE.** Independent spindle polishing and buffing lathe. Practically two lathes combined in one machine. Saves time and expense. Workman at either end of spindle can change wheels without stopping the machine. If the polisher at one end stops to change wheels, the other may continue with his work without interference. No countershaft required with this machine.

—HANSON & VAN WINELE COMPANY, NEWARE, N. J.

**LATHE.** The " IXL " for grinding and polishing. Detachable spindle, strong, efficient. Belt runs to shaft overhead or through floor.

—ZUCKER & LEVETT & LOEB CO., NEW YORK.

**LAVOISITE.** See Oxygen Generator.

**LEACHING BATTERIES**, or Leaching Cells.

—SWENSON EVAPORATOR CO., CHICAGO, ILL., (Formerly American Foundry & Machinery Co.)

**LEACHING CELLS.** See Cells, Leaching, Also Diffusion batteries.

**LEAD, ANTIMONIAL.** Used in Babbitt mixtures, etc., coffin hardware, etc.

—C. W. LEAVITT & CO., NEW YORK.

**LEAD-BURNING APPARATUS.** See also Welding, Oxygen.

—BUFFALO DENTAL MFG. CO., BUFFALO, N. Y.

**LEAD CONCENTRATES.** 60% to 70% Lead.

—THE WESTERN CHEMICAL MFG. CO., DENVER, COLO.

**LEAD-LINED** or covered pipe. See Pipe.

**LEAD REFINING.** Raw lead containing silver and other impurities is now refined on a large scale by the electrolytic process with advantageous results, both as regards costs, and clean work and high metal recoveries. Complete information on application.

—ANSON G. BETTS, TROY, N. Y.

**LEAD SULPHATE.**

—PENNSYLVANIA SALT MFG. CO., PHILADELPHIA, PA.

**LEBLANC CONDENSER.** See Condenser.

**LIGHTNING ARRESTERS.** Tips made from solid graphite blocks retain their firm sharp edges and corners. Possess peculiar non-arcing properties. Ease of drilling and threading assures reliable contact with metallic conductor. Contain no volatile or fusible material. Economically produced without moulds.

—INTERNATIONAL ACHESON GRAPHITE CO., NIAGARA FALLS, N. Y.

**LIME, CHLORIDE OF.** Bleaching Powder.

—GENERAL CHEMICAL CO., NEW YORK CITY.

**LIME-KILN LININGS.** See Linings.

**LEAD.** Acetate of lead crystals and solutions.

—GENERAL CHEMICAL CO., NEW YORK CITY.

**LINING TILES OF FUSED SILICA.** (See also Quartz, Fused in Part II of this Dictionary.)

—THERMAL SYNDICATE, LTD., NEW YORK.

**LINING TILES OF STONE-WARE:** For large collecting vats for floors in Laboratories, acid chambers, etc.

—J. W. SITTIG, NEW YORK.

(Other stoneware makers see Stoneware.)

**LININGS** for brass furnaces, cement kilns, cupolas, forges, furnaces, gas producers, locomotive fire boxes, lime kilns, ladles.

—THE ASHLAND FIRE BRICK COMPANY, ASHLAND, KY.

**LOCOMOTIVE FIRE-BOX LININGS.** See Linings.

**LOCOMOTIVE TILE** See Tile.

**LOCOMOTIVES.** Electric Mine and Industrial. Westinghouse. For handling iron and other ores and for general industrial service in metallurgical plants.

—WESTINGHOUSE ELECTRIC & MFG. CO., PITTSBURGH, PA.

**LUBRICANTS.** See also Aquadag, Gredag and Oildag.

**LUBRICANTS.** The lubricating properties of graphite have long been recognized, but their adoption has beyond question been materially retarded by the fact that all natural graphites contain a greater or less quantity of impurity detrimental to bearings. Now, however, soft, unctuous, graphite guaranteed at least 99% pure, is being manufactured in the electric furnace, and this gives assurance that graphite lubrication is destined to rapidly increase. Being amorphous, it is reduced to an impalpable powder, in which form it easily works into the minute irregularities of both bearing and shaft, reducing friction to the minimum and preventing wear of the parts. It can be mixed with grease or oil.

—INTERNATIONAL ACHESON GRAPHITE CO., NIAGARA FALLS, N. Y.

**LYE.** Lewis 98%. Powdered and perfumed. American. Saponifier, Greenwich.

—PENNSYLVANIA SALT MFG. CO., PHILADELPHIA, PA.

**MAGAZINES.** See Periodicals.

**MAGNESIA, ELECTRICALLY CALCINED.** Especially valuable as a heat and electric insulator when used in furnace packing, etc.

—NATIONAL CARBON CO., CLEVELAND, OHIO.

**MAGNESIA BRICK.** See Brick, Magnesia.

**MAGNESIA, ELECTRO.** Supplied in powder or granular form or as articles molded from it, such as tubes, crucibles, pyrometers, basins, pipes, muffles, plates and triangles. The electro-magnesia is highly infusible and will stand a temperature of 1900° C. It is especially valuable for heating and melting alkaline substances.

—NATIONAL CARBON CO., CLEVELAND, OHIO.

**MAGNESIA.** Epsom Salt.

—GENERAL CHEMICAL CO., NEW YORK CITY.

**MAGNESITE.**

—ATKINS, KROLL & CO., SAN FRANCISCO, CAL.

**MAGNESITE.** The ideal basic refractory. Dead-burned or grain magnesite, for making the bottoms in basic open-hearth steel furnaces. A more limited use of magnesite is to make bottoms in mechanical puddling furnaces, heating furnaces, and tamped in the side walls of copper reverberatories to take the splash of the metal.

—HARBISON-WALKER REFRACTORIES CO., PITTSBURGH, PA.

**MAGNESITE BRICK.** See Brick, Magnesite.

**MAGNESITE CEMENT.**

—HARBISON-WALKER REFRACTORIES CO., PITTSBURGH, PA.

**MAGNESIUM.** Metallic. Practically pure, made by the electrolytic process in stick form. Valuable deoxidizing agent for iron, steel, copper, aluminium, brass, bronze, nickel and zinc mixtures. Specific gravity 1.74, melting point 649° C. (1200 °F.)

—FUERST BROS. & CO., NEW YORK.

—C. W. LEAVITT & CO., NEW YORK.

**MAGNETIC SEPARATORS.** For separating from each other materials of different magnetic permeability. These machines solve many problems in metallurgy, ore concentration and industrial economy, for instance: Eliminating iron from brass and other metal turnings and fine scrap; recovering iron from foundry refuse; removing scrap iron from coal, grain, drugs, etc., where any piece of iron is liable to injure the crushing or grinding machinery; concentrating ore, such as iron, copper sulphides, zinc blends, nickel tin, tungsten, monozite, corundum, energy, etc.; removing magnetite from materials because of chemical objections; removing iron and recovering abrasive material from grinding refuse, etc. We have been building magnetic separators for years and our extensive experience is at the service of our customers. Preliminary tests made without charge.

—DINGS ELECTRO-MAGNETIC SEPARATOR CO., MILWAUKEE, WIS.

**MAGNETIC SEPARATORS.** Wet or dry. Any capacity. For concentrating poor iron ores in crushings from 1" down; for separating from raw crushings ores of copper, manganese, zinc, lead, molybdenum, nickel, cobalt, wolfram, tin, monazite sands, chromium gold, silver and platinum.

—MARCUS RUTHENBERG, LONDON.

**MANGANESE.** Registered trade-mark "Thermit." Free from carbon, made by the aluminothermic method. As it contains

neither carbon nor iron, it is especially useful as a deoxidizing agent in the copper, brass and nickel industries; also for the manufacture of high-class steel. Melting point, 1245 degrees C. (2273 degrees F). —GOLDSCHMIDT THERMIT CO., NEW YORK.

**MANGANESE.**

—PENNSYLVANIA SALT MFG. CO., PHILADELPHIA, PA.

**MANGANESE.** Fused. 98-99% pure, carbonless. (Traces of iron).

—ROESSLER & HASSLACHER CHEMICAL CO., NEW YORK.

**MANGANESE-COPPER.** Made in the electric furnace from the pure oxide of manganese. Contains from 25% to 30% manganese and is practically free from iron and other impurities. Used for making manganese bronze and for introducing small amounts of manganese in copper alloys. A second brand, Manganese-Copper No. 2, contains 25% manganese and about 3% iron; used for making manganese bronze.

—ELECTRIC SMELTING & ALUMINUM CO., LOCKPORT, N. Y.

**MANGANESE-COPPER.** (30-70%) Registered trade-mark "Thermit." Offers the same advantages as a deoxidizing agent for copper, brass and nickel, as pure manganese. Is produced by the aluminothermic method. The melting point of manganese-copper being lower than that of pure manganese, however, makes this alloy more convenient to use. It is free from carbon and technically free from iron.

—GOLDSCHMIDT THERMIT CO., NEW YORK.

**MANGANESE-COPPER alloy.**

—E. J. LAVINO & CO., PHILADELPHIA, PA.

**MANGANESE ORE.**

—E. J. LAVINO & CO., PHILADELPHIA, PA.

**MANGANESE OXIDE.**

—FUERST BROS. & CO., NEW YORK.

**MANGANESE-TIN.** (50-50%) Registered trade-mark "Thermit." Made with pure metallic manganese, free from carbon, produced by the aluminothermic method. Is technically free from iron and the melting point being lower than that of metallic manganese, makes this alloy more convenient to use as a deoxidizing agent.

—GOLDSCHMIDT THERMIT CO., NEW YORK.

**MANGANESE-ZINC.** (20-80%) Registered trade-mark "Thermit." Made with pure metallic manganese, free from carbon, produced by the aluminothermic method. Is technically free from iron and the melting point being lower than that of metallic man-

ganese, makes this alloy more convenient to use as a deoxidizing agent.

—GOLDSCHMIDT THERMIT CO., NEW YORK.

**MANGANESE WIRE.** See Wire.

**MANIFOLDS HYDRAULIC. ATWOOD.** A manifold is a group of valves, piping and operating valves designed to operate by hydraulic pressure various apparatus, about iron and steel works. The manifolds are fitted up complete in the shop and are shipped ready for installation.

—PITTSBURGH VALVE, FOUNDRY & CONSTRUCTION CO., PITTSBURGH, PA.

**MARIOTTE BOTTLES.** With outlets for water gauge and outlet for ground-in cock at bottom, made of acid-proof stoneware in various capacities.

—DIDIER-MARCH COMPANY, NEW YORK.

(Other stoneware makers see Stoneware.)

**MARIOTTE DROP FLASKS OF STONE-WARE.** With two water gauge sockets, bottom outlet, ground in cock.

—J. W. SITTIG, NEW YORK.

(Other stoneware makers see Stoneware.)

**MATS AND MATTING, RUBBER.** Moulded rubber mats, Treads, Perforated rubber mats of any shape or size, Corrugated matting in all thicknesses up to 72" in stock or made to order. This material makes a splendid floor covering as it does not absorb dust or dirt. It decreases noise, and is invaluable as a floor insulation in front of switchboards, etc. We use only such stock as will insure maximum wear.

—BOSTON BELTING COMPANY, BOSTON, MASS.

**MATS AND MATTING.** Perforated mats, knob matting, combination or checker-board matting, corrugated and cross-corrugated matting.

—REVERE RUBBER CO., BOSTON, MASS.

**MAX MILL.** See Crushing and Grinding. Mill.

**MELTING FURNACE BLOWERS.** See Blowers Piqua Positive.

**MELTING FURNACES.** See Furnaces Melting.

**METALLIC FILAMENT MANUFACTURE.** Apparatus made of pure fused silica supplied for the baking of metallic filaments at high temperatures. Entirely free from carbon and not subject to breakage through changes of temperature. Tubes and boats for filament furnaces made to customers requirements.

—THE THERMAL SYNDICATE LTD., NEW YORK.



**METALLURGY.** See Cyanide Process, Chlorination, Electrolysis, Furnaces, etc.

**METALLURGICAL EQUIPMENT** and Milling Machinery of any kind for works for the recovery of metals, or from their ores.

—ABBE ENGINEERING CO., NEW YORK.

—ALLIS-CHALMERS CO., MILWAUKEE, WIS.

—COLORADO IRON WORKS CO., DENVER, COLO.

—HARDINGE CONICAL MILL CO., NEW YORK.

—LEHIGH CAR WHEEL & AXLE WORKS, CATASAUQUA, PA.

—PENNSYLVANIA CRUSHER CO., PHILADELPHIA, PA.

—THOS. PROSSER & SON, NEW YORK.

—RAYMOND BROS. IMPACT PULVERIZER CO., CHICAGO, ILL.

—SALT LAKE HARDWARE CO., SALT LAKE CITY.

**MILL BRICK.** See Brick.

**MILLS, CRUSHING AND GRINDING.** See Crushing and Grinding.

**MINT FURNACES.** See Furnaces, Mint.

**MIXER, CHASER.** Consists of a strong iron pan in which travels a roller followed by scrapers which serve to keep the material on the floor of the pan and position to be passed over by the roller. It is used for mixing mortar, putty, white lead, heavy pastes and similar materials. Also for crushing glass oxide of copper and other materials in a dry or semi-dry state.

—J. H. DAY CO., CINCINNATI, OHIO.

**MIXERS.** Various kinds.

—ABBE ENGINEERING CO., NEW YORK.

**MIXERS.** For mixing materials, either dry or wet, or wet and dry together. The mixers combined with evaporators for mixing solutions and emulsions, or keeping material in suspension. The same machine may be used for evaporating the liquid after it is mixed, if desired. These machines are used in connection with condensers or any type or may be used without condensers. If desired may be steam heated, fire heated, or heated with hot gases or any kind. Are very rapid in their operation in both mixing and evaporating the mixed product made in large and small openings and to suit any conditions or requirements.

—BUFFALO FOUNDRY & MACHINE CO., BUFFALO, N. Y.

**MIXERS, DAY'S.** The tank is made of wrought steel bolted to cast iron ends. The shafts of the mixer are steel and the bearings made of gun metal. Stuffing boxes are made of gun metal in the form of a sleeve which fits over the shaft, effectually preventing the material coming into contact with the bearings and oil. Day's mixers are made in over fifty forms. Each machine being per-

fectly adapted for its particular purpose, with tank capacities ranging from fifty to five hundred gallons, and with mixing arms or agitators made for the work for which the mixer is intended.

—J. H. DAY CO., CINCINNATI, OHIO.

**MIXERS, DAY'S IMPERIAL.** Especially strong and made for mixing heavy pastes. It is also made with steam jacket for heating material while mixing.

—J. H. DAY CO., CINCINNATI, OHIO.

**MIXERS** for heavy masses, pastes, liquids and powders. All sizes; steam and water jacketed.

—J. H. DAY CO., CINCINNATI, OHIO.

**MIXERS.** Of stoneware, for thorough mixing of chemical solutions. Non-corrosive. Any size or style.

—CHARLES GRAHAM CHEMICAL POTTERY WORKS, BROOKLYN, N. Y.

**MIXERS.** Kneading and mixing machinery of highest efficiency for handling rubber materials, soaps, paints, greases, chemical compounds of all kinds. All types for all requirements. Cincinnati mixer, of rigid construction, for mixing pastes, greases, polishes, and powdered material. Mastodon mixer for mixing and kneading heavy pastes and masses, like putty, whitelead, lithograph inks, soaps, and lubricating greases; this type may also be jacketed for steam connection for heating the material during the mixing operation. Thorohred single-arm mixer for the preparation of soft substances, like soaps and polishing materials. Twin paste and color mixer for mixing white lead in oil, for stiff paste and paints. Pony mixer, presto mixer, typhoon mixer, etc.

—LYNN-SUPERIOR CO., CINCINNATI, OHIO.

**MIXERS.** Dopp, consist of the cast-iron seamless steam-jacketed kettles, equipped with agitators of various types. The agitators are operated either by hand or by belt power, and in the smaller sizes can be easily and quickly raised out of the kettle and swung to one side. The choice of the type of agitator is governed by the nature of the liquid or semi-solid materials to be mixed, ranging from light watery fluids to thick doughy pastes. One type of agitator scrapes the entire inside surface of the kettle to prevent the overheating of the materials.

—SOWERS MFG. CO., BUFFALO, N. Y.

**MIXERS.** Heavy mass mixers for mixing all classes of plastic materials in sizes from 5 gallons upwards.

—F. J. STOKES MACHINE COMPANY, PHILADELPHIA, PA.

**MIXERS, PONY.** This machine is used for mixing plastic substances or liquids. The can revolves in one direction and the stirring arms in the opposite direction. The stirring arms can be raised with rack and pinion, which allows the can to be readily removed for

emptying. The can is made of heavy galvanized iron. Capacity 25 gallons. Floor space, 46 in. x 30 in. Weight 400 lbs. pulleys, 18 in. x 4 in. Height, 4 ft. 3 in. Revolutions 25.

—F. J. STOKES MACHINE COMPANY, PHILADELPHIA, PA.

**MIXERS.** Steam-jacketed kettles with mixers.

—STUART & PETERSON CO., BURLINGTON, N. J.

**MIXERS AND KNEADERS, UNIVERSAL.** For use in almost any industry in one or other of its varieties. Made in a number of sizes or capacities and in various types to suit the requirements incident to the material which it has to handle.

**Type I.** Made in sizes up to two gallons, chiefly for laboratory purposes. The machine although comparatively light is strong enough to handle materials of the consistency of putty and if desired it can be supplied with steam-jacket.

**Type II.** Made in capacities of 2,  $4\frac{1}{2}$  and 9 gallons. This machine has a cast iron trough which is tooled and finished on the inside. The trough can be taken apart so as to facilitate the removal of the agitators and thereby allowing thorough cleaning of the machine. The machine is especially adapted for mixing and kneading pill masses and all putty-like material.

**Type IV.** Called "Masticator" and is especially adapted for working very tough masses, such as, India rubber and gutta percha. The machine is provided with steam jacket and heatable blades. Where required, steam and cold water can be turned on alternately. The machine cannot be tilted but discharging of the material is effected by raising a flap door in front of the machine. This type of machine is made in sizes of 10 and 46 gallons capacity.

**Type II-V and II-VI.** Called the Nitro-type as it is used in the manufacture of all kinds of smokeless powder and other explosives. This machine is in use in great numbers by nearly all the governments of the globe as well as by a large number of private gunpowder manufacturers. Made in sizes of 20 and 50 gallons. The trough is of cast iron, tooled and polished on the inside. For heating or cooling, as the case may be, the bottom part of the trough has a jacket. The trough can be taken apart similar to type II so as to allow removal of agitators and thorough cleaning. The machine can be provided with an air tight cover so as to prevent loss of solvent or escape of noxious vapors. The machine once charged with the ingredients can be left to itself until the kneading and mixing process is completed. The driving axle of the machine is provided with a safety-lock which makes it impossible for the machine to get accidentally started. The machine is perfectly safe to handle. As far as we know no explosion ever occurred in a mixing room where our machines were used.

**Type V and VI.** Made in sizes from 20 to 250 gallons. The type V and VI being practically identical with this difference, that type V is made for hand tilt, whereas type VI is tilted by power. The machine is suitable for almost every kind of work and is used principally in the manufacture of macaroni, vermicelli, paints, putties and a large variety of chemical products.

**Type IX.** Made in sizes of 50, 100 and 150 gallons capacity. The trough of the machine is provided with steam jacket and heatable agitators and the machine is tilted by power. All our steam jackets are guaranteed to stand a working pressure of up to 100 pounds per square inch or seven atmospheres. This machine is especially adapted for work where high, low or varied temperature is required, as for instance in the manufacture of such materials as chocolate, cocoa, chewing gum, linoleum, electric carbon, etc.

**Type X.** The distinctive feature of this type of machine is, that they cannot be tilted; discharge of the material being effected by means of flaps or valves at the bottom of the trough. The larger machines are usually supplied with four openings. This type of machine is built in sizes of from 100 to 2650 gallons capacity. They are chiefly used for mixing or stirring liquids, semi-liquids, granulated materials, dry powders or colors which offer comparatively little resistance.

—WERNER AND PFLEIDERER, SAGINAW, MICH.

**MIXING TANKS.** Graham chemical stoneware tanks in all sizes, for mixing corrosive liquids containing acids, alkalis, chlorine etc. Furnished in either round or square pattern with inlets, outlets, etc., according to needs of customer. Guaranteed to be chemical proof.

—CHARLES GRAHAM CHEMICAL POTTERY WORKS, BROOKLYN, N. Y.  
(Other stoneware makers see Stoneware.)

**MIXING TANKS, Kettles and Machinery.** Queen mixing kettle, plain or porcelain lined; any style or size to order. Golden Crown mixing machine, porcelain lined, double mixer, capacity 15 gallons.  
—STUART & PETERSON CO., BURLINGTON, N. J.

#### **MOLYBDATE OF AMMONIA.**

—PRIMOS CHEMICAL CO., PRIMOS, PA.

**MOLYBDENUM.** Registered trade-mark "Thermit". Manufactured by the aluminothermic process. Of very high and uniform quality and free from carbon.

—GOLDSCHMIDT THERMIT CO., NEW YORK.

**MOLYBDENUM.** Fused, 98–99% pure carbonless. Also powder 90–92%.

—ROESSLER & HASSLACHER CHEMICAL CO., NEW YORK.

**MOLYBDENUM.** Metal. Low carbon.

—PRIMOS CHEMICAL CO., PRIMOS, PA.

**MOLYBDIC ACID.** For phosphor determinations. Chemically pure 100%  $\text{MoO}_3$ , free from ammonia. Commercially pure 80%  $\text{MoO}_3$ , with  $2\frac{1}{2}$  to  $7\frac{1}{2}$ %  $\text{NH}_3$ , but free from other impurities.

—ROESSLER & HASSLACHER CHEMICAL CO., NEW YORK.

**MONEL METAL WIRE.** See Wire.

**MONTEJUS, AUTOMATIC.**

—BETHLEHEM FOUNDRY & MACHINE CO., SOUTH BETHLEHEM, PA.

**MONTEJUS, AUTOMATIC.** System Dr. Plath, made of acid-proof stoneware, in various sizes. Work automatically. The valves are ball valves accurately ground.

—DIDIER-MARCH COMPANY, NEW YORK.

(Other stoneware makers see Stoneware.)

**MONTEJUS AUTOMATIC "WOTAN."** Operated by one cock only.

**MONTEJUS, AUTOMATIC.** An apparatus for lifting acids automatically and continuously by means of compressed air or steam. It takes the place of the old style "Acid Egg." For description as to general appearance and construction see catalog OO-2. This Montejus can be placed anywhere; takes up little space; requires no attention whatever; works continually. The pressure of compressed air or steam can vary between 30 and 70 pounds per square inch, without interfering with the regular working of the apparatus. The great advantage of this apparatus is the possibility to work it economically at pressures higher than actually required by the height of lift and specific gravity of acid. Catalog OO-2.

—SCHUTTE & KOERTING CO., PHILADELPHIA, PA.

**MONTEJUS, AUTOMATIC.** Of stoneware, new design, simple construction, and very efficient; made in various sizes, capable of lifting acids in quantities up to 2600 gallons per hour.

—J. W. SITTING, NEW YORK.

**MONTEJUS** or Acid Eggs of Stoneware, acid proof, exceedingly tough material, highly resistant against pressure.

—J. W. SITTING, NEW YORK.

**MORTARS.** With pestle, made of acid-proof stoneware, in various sizes.

—DIDIER-MARCH COMPANY, NEW YORK.

(Other stoneware makers see Stoneware.)

**MOTORS, ELECTRIC.** Alternating Current and Direct Current. For every character of service.

—ALLIS-CHALMERS CO., MILWAUKEE, WIS.

**MOTORS.** Westinghouse dust-proof motors. For cement, calcining, ore-crushing plants and steel mills.

—WESTINGHOUSE ELECTRIC & MFG. CO., PITTSBURGH, PA.

**MOTORS.** Westinghouse industrial motors. Specially insulated to resist the attacks of fumes.

—WESTINGHOUSE ELECTRIC & MFG. CO., PITTSBURGH, PA.

**MOTORS.** Westinghouse large industrial motors. Any required capacity for operating the heaviest mill machinery, on either alternating or direct current circuits.

—WESTINGHOUSE ELECTRIC & MFG. CO., PITTSBURGH, PA.

**MOTORS.** Westinghouse mill motors. Type "MS" for alternating current and type "MT" for direct current circuits in steel mill and other severe service.

—WESTINGHOUSE ELECTRIC & MFG. CO., PITTSBURGH, PA.

**MOTOR-GENERATOR.** Fly-wheel sets. Westinghouse. For supplying current to roll motors, and for cutting off the "peak" of the load.

—WESTINGHOUSE ELECTRIC & MFG. CO., PITTSBURGH, PA.

**MOULDS.** Where formerly iron moulds were used for casting metals, such as gold and silver, graphite moulds made from solid Acheson graphite blocks 99% pure are now employed with increased success. Oxidation of the mould is very slight, and the ingot surface is smooth and bright, showing the reducing action of the graphite on the molten metal. Ease of machining renders economical the production of moulds of various forms. Used with success in the glass industry.

—INTERNATIONAL ACHESON GRAPHITE CO., NIAGARA FALLS, N. Y.

**MUFFLE FURNACES.** See Furnaces, Muffle.

**MUFFLE FURNACE BLOWERS.** See Blowers Piqua Positive.

**MUFFLES.** Plumbago, a combination of pure ceylon plumbago and Klingenburg clay, two of the highest heat resisting substances known. Sizes 3" x 4" x 2½" high to 6" x 8½" x 4½" high. Clay, made of the finest clay procurable in same sizes as plumbago. Write for Catalog B.

—BUFFALO DENTAL MFG. CO., BUFFALO, N. Y.

**MUFFLES.** For extremely high temperature work, 99% pure graphite muffles electrically produced at a temperature of 7500° F., hence highly refractory, are essential to secure stable service. Easily machined, threaded and cut. All sizes up to 8" diam. made to order.

—INTERNATIONAL ACHESON GRAPHITE CO., NIAGARA FALLS, N. Y.

**MUFFLES.** Pure silica. Entirely resist high temperatures and are absolutely clean. Supplied in various shapes for all types of

furnaces. Catalog free. (See also Quartz fused, in Part II of this Dictionary).

—THE THERMAL SYNDICATE LTD., NEW YORK.

**MULTIPLE EFFECTS.** See Evaporators.

**NEWAYGO SCREEN.** See Screen, Newaygo.

**" NICHROME " WIRE.** See Wire.

**NICKEL METAL.**

—FUERST BROS. & CO., NEW YORK.

—ROESSLER & HASSLACHER CHEMICAL CO., NEW YORK.

**NICKEL WIRE.** See Wire.

**NICKEL-ALUMINIUM.** See Aluminium, Nickel.

**NICKEL SALTS.** For nickel plating. Free from impurities. Sample analyses; nickel ammonium sulphate (double salt); 15% nickel, trace iron, no arsenic or insoluble matter. Nickel sulphate (single salt); 21% nickel, no arsenic, traces of iron and insoluble matter. Made by the Mond Nickel Co. of England. Sole agents.

—FUERST BROS. & CO., NEW YORK.

**NITRATING CENTRIFUGALS.** See Centrifugals, Nitrating.

**NITRATING POTS.** Of stoneware; in different forms and sizes.

—J. W. SITTIG, NEW YORK.

**NITRATING PLANTS.** system Thomson. The "displacement" system for the nitration of cotton in the manufacture of gunpowder, nitrocellulose, artificial silk, etc. Gives highest yield with practically no loss or danger from fumes, acid splashes and burning off.

—DIDIER-MARCH Co., NEW YORK.

(Other stoneware makers see Stoneware.)

**NITRATING POTS AND KETTLES.** Made of acid-proof stoneware for manufacturing gun cotton, artificial silk, nitrocellulose, picric acid, etc., in various sizes and shapes.

—DIDIER-MARCH COMPANY, NEW YORK.

(Other stoneware makers see Stoneware.)

**NITRIC ACID PLANTS.** of all capacities, systems Valentiner, Guttman, Uebel, Griesheim, etc.

—DIDIER-MARCH Co., NEW YORK.

(Other stoneware makers see Stoneware.)

**OIL ATOMIZING BLOWERS.** See Blowers, Piqua Positive.

**OILDAG.** An ideal lubricant, consisting of deflocculated Acheson graphite in colloidal suspension or solution in oil. Professor C. F.

Mallory in a report, reaches the following conclusions: "For the same load carried on a journal with and without graphite the consumption of oil using graphite may be reduced at least one-half. The reduction of friction is at least 25% when using Oildag with an equivalent saving in power. The low coefficient of friction shown by the fuel oil, gravity 35° suggests the wide use of fuel oils as lubricators." Two special committees of the Automobile Club of America found "that Oildag added to the lubricating oil in suitable proportions and the other Acheson preparations, increases the efficiency of the engine; decreases the smoke from the exhaust; decreases the quantity of lubricating oil; retains compression in cylinders; causes the engine and gears to run more sweetly; decreases the liability of burning out bearings; increases the life of all bearings."

—INTERNATIONAL ACHESON GRAPHITE CO., NIAGARA FALLS, N. Y.

**OIL FURNACE BLOWERS.** See Blowers, Piqua Positive.

**OIL HOSE.** See Hose, Oil.

**OIL PROCESS, RUTHENBURG.** For treating sliming sulphides by gravity, no flotation, making savings as high as 98%.

—MARCUS RUTHENBURG, LONDON.

**OIL STORAGE TANKS.** See Tanks, Oil Storage.

**OPEN-HEARTH BRICK.** See Brick.

**OPEN-HEARTH FURNACES.** See Furnaces, Open Hearth.

**ORE CAR DUMPING** machines.

—THE BROWN HOISTING MACHINERY CO., CLEVELAND, OHIO.

**ORE CHROME.**

—ATKINS, KROLL & CO., SAN FRANCISCO, CAL.

**ORE, CHROME.** Sesquioxide of Chromium, exceedingly refractory, dense and neutral; it is neither acid, basic, reducing nor oxidizing. Used principally in basic open hearth furnaces in such places as along the back walls of stationary and tilting furnaces; on the floors of the ports, and as a protection to the silica brick in the ports and furnace blocks. Chrome ore is generally useful where chemical action and high temperature combined are to be resisted. We can furnish a chrome ore running especially low in silica and containing from 38 to 42 per cent of chromium sesquioxide, and a chrome ore running 50 per cent chromium sesquioxide or over shipping either in lump form or finely ground, as ordered.

—HARBISON-WALKER REFRATORIES CO., PITTSBURGH, PA.

**ORE, CHROME.** Refractory for furnace linings.

—E. J. LAVINO & CO., PHILADELPHIA, PA.



**ORES AND RARE MINERALS.**

- ATKINS, KROLL & CO., SAN FRANCISCO, CAL.
- GEO. G. BLACKWELL, SONS & CO., LTD., LIVERPOOL, ENG.
- EIMER & AMEND, NEW YORK.
- E. J. LAVINO & CO., PHILADELPHIA, PA.
- C. W. LEAVITT & CO., NEW YORK.

**ORE-HANDLING** storage and rehandling machinery.

- THE BROWN HOISTING MACHINERY CO., CLEVELAND, OHIO.

**ORE MILLING MACHINERY.** See Metallurgical Equipment and Milling Machinery.

**ORE TESTING.** See Testing of Ores.

**ORE TREATMENT.** See "Cyanide Process" and "Filter. Slimes."

- THE MOORE FILTER CO., NEW YORK.

**ORE WASHER.** Scaife patent automatic trough washer. For economically cleaning and concentrating gold, silver, lead, manganese and other ores, especially where ores of low grade are handled in large quantities. See also under "Washer."

- SCAIFE FOUNDRY & MACHINE CO., LTD., PITTSBURGH, PA.

**OXONE.** A solid non-brittle mass of fused sodium peroxide, cast into moulds of various shapes. Contact with water liberates oxygen gas of 99.6% purity, the impurity being moisture. On account of its capacity to absorb carbon dioxide and, while in the state of reaction, to destroy germs, it is also being used for the purification and regeneration of air.

- ROESSLER & HASSLACHER CHEMICAL CO., NEW YORK.

**OXONE PRESSURE GENERATOR.** Also in the market under the name Goodyear Generator. Smallest size holding 3 lbs. oxone or producing about 7 cu. ft. of the gas. Larger types. The pressure is created automatically. Is ordinarily adjusted to standard of 3 lbs. Is able to automatically work up, however, to 30 lbs.

- ROESSLER & HASSLACHER CHEMICAL CO., NEW YORK.

**OXONE GENERATOR, PORTABLE.** Low pressure; used principally for medical purposes and in laboratories.

- ROESSLER & HASSLACHER CHEMICAL CO., NEW YORK.

**OXY-ACETYLENE PROCESS.** See Welding, Oxy-acetylene, and Cutting, Oxy-acetylene.

**OXYGEN.** For sale in oxygen cylinders. Oxygen cylinders recharged. See Welding, Oxy-acetylene.

- AMERICAN OXYGEN CO., PHILADELPHIA, PA.

**OXYGEN GENERATOR** and compressor. Oxygen gas can be produced about 97 to 98% pure with the chlorate of potash process in any oxygen plant and compressed into cylinders. The maximum pressure 300 lbs. per sq. in.

—DAVIS-BOURNONVILLE CO., NEW YORK.

**OXYGEN GENERATOR, LAVOISITE.** Water is admitted to Lavoisite in the generator causing an evolution of oxygen gas, which passes to the scrubber and thence to the receiving tank. As this generator can be shipped to any point and set up, and as the Lavoisite is shipped in drums, pure oxygen can be produced on a large or small scale at small cost and without danger. Specially useful in connection with acetylene for oxy-acetylene welding and cutting. See Welding, Oxy-acetylene.

—SOWERS MFG. CO., BUFFALO, N. Y.

**OXYGENITE.** A product of an electrolytic process, in the form of a grey pulverulent mass resembling fine sand, partially soluble in water, and possessing the property of releasing by incineration in a closed vessel all the oxygen it contains, amounting to about 5½ cubic feet per lb. It can be ignited by ignition powder or other means. Oxygenite burns slowly and without flame. The residue of the combustion is a friable slag, which makes a valuable fertilizer. Oxygenite can be kept for an indefinite time without deteriorating; it is not affected by the action of even moist air.

—INDUSTRIAL OXYGEN CO., NEW YORK.

**OZONE.** Siemens ozone apparatus for air and water sterilization. For houses and hospitals. For city water works. Movable apparatus for army.

—SIEMENS & HALSKE CO., NEW YORK.

**OZONIZER. VOHR ELECTRIC.** An electrical apparatus producing ozone—O<sub>3</sub>—concentrated, energized oxygen—the most important property of which is its high oxidizing power. Through this process air is purified. Industrially ozone may be applied wherever oxidation is an important factor. Laboratory and staff of electrochemists are at the service of any reputable firm who may desire scientific research with reference to the application of the Vohr method of ozone production to their particular requirements.

—STANDARD ELECTRO-UTILITIES CO., CHICAGO, ILL.

**PACKER, DAY'S LIGHTNING.** For quickly and accurately filling packages of from a half ounce to 6 pounds. It will fill cans, wide mouth bottles or packages of any shape and has a capacity of from two to twelve thousand per day. The material is forced out and does not depend upon gravity, the package may be loosely or compactly filled as desired. It is made with or without automatic feeder.

—J. H. DAY CO., CINCINNATI, OHIO.

**PACKING MACHINES.** The Daisy Packer is made for filling sacks and kegs from eight to ninety-eight pounds in weight. Used for flour, cement, dry paints, whiting and similar material. It is made with an iron frame for the purpose of keeping the gears in position. Tubes and gears of different sizes are furnished according to requirements. The machine is 7 feet 4 inches high and the width of the frame 23 inches.

—J. H. DAY CO., CINCINNATI, OHIO.

**PACKINGS.** Usudurian (Turtle Brand) is an unvulcanized, self-vulcanizing rubber sheet packing for any kind of steam, hot air, or hot water joints. This packing applied in its unvulcanized state readily accommodates itself to any unevenness in the surface between which it is placed. When steam comes in contact with it, Usudurian becomes vulcanized. It is not affected by contraction or expansion and can be used on what is called a vibrating joint. Particularly adapted to packing steam-chest covers and all superheated steam joints; can be made with wire insertion. Black Hawk sheet packing; a high-grade red compound with a plumbago-treated surface. Joints made with Black Hawk can be broken and remade many times without spoiling the life of the packing. Not affected by ammonia and therefore suitable for ice-plants. Not affected by liquors, steam heat, or alkalis. Giant Red Crescent Sheet Packing for high-pressure steam packings. Black Cross Packing a combination of Usudurian and Giant. Ammonia rings for ice machines.

—REVERE RUBBER CO., BOSTON, MASS.

**PACKINGS, FLANGE AND JOINT.** We manufacture a line of packings, either pure, or with cloth, wire or sheet metal insertion that will make perfect joints when used in connection with air, steam, water, oil, ammonia, alkalies, etc.

—BOSTON BELTING COMPANY, BOSTON, MASS.

**PACKINGS, PISTON AND VALVE ROD.** We supply in round or square lengths, also in spiral or ring form, packings made from the best material for packing piston rods and valve stems of steam, gas and air pumps; steam, gas and air engines, etc. Also packings for hot water and hydraulic purposes.

—BOSTON BELTING COMPANY, BOSTON, MASS.

#### **PAINT, INSULATING.**

—FUERST BROS. & CO., NEW YORK CITY.

**PAINT PIGMENT.** Graphite as a paint pigment for steel and iron is unexcelled. As such it is of value directly in proportion to its graphitic carbon content and fineness. Acheson graphite is the purest offered, and, being, amorphous, is capable of the finest grinding. Being chemically inert, it is unaffected by atmospheric conditions, gases, fumes and moisture, while it is a non-carrier of oxygen, thus affording real protection to the iron. Works easily under the brush, but does not brush out too thin.

—INTERNATIONAL ACHESON GRAPHITE CO., NIAGARA FALLS, N. Y.

**PALM OIL BLEACHER.** Bleaching of palm oil is successfully accomplished without chemicals with the Koerting palm oil bleacher, by means of oxygen in the air. This apparatus consists of a closed iron vessel, on the top of which is installed an exhaustor. In the vessel is a heating coil, and at the bottom an annular air distributing pipe with a large number of holes connected to an air inlet pipe. The liquid is admitted to the bleaching vessel, and the vessel then closed and steam admitted to the coil until the oil has reached 212 deg. F. Exhaustor is then started and air drawn through the oil, thus utilizing the oxygen of the air for bleaching. The natural properties of the oil is in no way affected. Bleaching process takes about two hours, and no attention is required after starting until the process is completed. Manufacturers' catalog EE-4 fully explains.

—SCHUTTE & KOERTING CO., PHILADELPHIA, PA.

**PANS VACUUM.** Of cast iron with copper bottom or copper throughout, also special pans lined with lead, silver, etc. These pans can be used for a great variety of products and long experience in this work insures a pan of proper design. These pans with or without agitators are designed for the particular material to be treated and are built in all sizes from 20 to 2,500 gallons. These pans are heated either by steam coil or tubular heater.

—E. B. BADGER & SONS CO., BOSTON, MASS.

**PANS, VACUUM.** Built in all sizes and capacities from sheet or cast metal best suited for desired service. If necessary inside of pans can be lined with block tin or sheet lead. For reducing solutions to solids pans are furnished with stirring arrangement.

—BAEUELE & MORRIS, PHILADELPHIA, PA.

**PANS (VACUUM) AND EVAPORATORS.** Either copper or iron vacuum pans or stills 25 gallons capacity upwards. Single or multiple-effect vertical evaporators for concentrating various solutions.

—F. J. STOKES MACHINE CO., PHILADELPHIA, PA.

**PANS, VACUUM.** Plain or porcelain-lined. With or without mixers. Catalog 216.

—STUART & PETERSON CO., BURLINGTON, N. J.

#### **PANS, VACUUM.**

—KESTNER EVAPORATOR CO., PHILADELPHIA, PA.

—SOWERS MFG. CO., BUFFALO, N. Y.

—SWENSON EVAPORATOR CO., CHICAGO, ILL. (Formerly American Foundry & Machinery Co.)

—ZAREMBA CO., BUFFALO, N. Y.

(See also Evaporators.)

**PAPER PULPING MACHINE, UNIVERSAL.** As its name indicates this machine is built on the lines of our "Universal" Knead-

ing & Mixing Machine (see Mixers) but is especially adapted for tearing up and pulping all kinds of paper, such as, dry broken, wet broken, sulphite fibre, ground wood, oil paper, paper shavings, folding box, box board cuttings, scrap, etc., all classes of paper-stock which has no linen or canvas lining. The chief advantage of this machine is that it preserves the fibre as the material handled is subjected to a tearing not cutting action. The trough of this machine is made of cast iron of sufficient weight to withstand the hard usage it is subjected to. The saddle of the trough is toothed and removable. The cast steel agitators are provided with toothed steel plates which can be easily adjusted. This machine is made in two sizes of 160 to 210 gallons capacity respectively.

—WERNER & PFLEIDERER, SAGINAW, MICH.

**PEBBLE MILL.** See Crushing and Grinding.

**PERBORATE MAGNESIUM.** Averaging 8% available oxygen. White powder.

—ROESSLER & HASSLACHER CHEMICAL CO., NEW YORK.

**PERBORATE SODIUM.**  $\text{NaBO}_3 \cdot 4\text{H}_2\text{O}$ . Average 10% available oxygen. A white powder which on solution in water forms hydrogen peroxide and borax. For bleaching panama hats, fine laces, silk and ostrich feathers.

—ROESSLER & HASSLACHER CHEMICAL CO., NEW YORK.

**PERBORATE ZINC.** Formula not determined. Averaging 7 to 8% available oxygen. White powder, soluble in acid medium, insoluble in water.

—ROESSLER & HASSLACHER CHEMICAL CO., NEW YORK.

**PERCOLATORS.** Of acid-proof stoneware, in various sizes and shapes with loose sieves.

—DIDIER-MARCH COMPANY, NEW YORK.

(Other stoneware makers see Stoneware.)

**PERCOLATORS.** Porcelain-lined.

—STUART & PETERSON CO., BURLINGTON, N. J.

**PERFORATED METAL.** For all purposes.

—ALLIS-CHALMERS CO., MILWAUKEE, WIS.

—COLORADO IRON WORKS CO., DENVER, COLO.

**PERIODICALS.** Back numbers of magazines, trade papers and newspapers supplied at moderate rates. Clippings on special subjects furnished promptly. Magazines of all kinds bought and exchanged.

—A. W. CASTELLANOS, JERSEY CITY, N. J.

**PEROXIDE CALCIUM.** 70 to 80%  $\text{CaO}_2$ . Averaging 17% available oxygen. Balance  $\text{Ca(OH)}_2$  and  $\text{CaCO}_3$ . Cream color

powder. Soluble in acid medium. Suspended in water more stable than magnesium peroxide. Very slowly dissociates active oxygen. For bleaching oils and therapeutic purposes.

—ROESSLER & HASSLACHER CHEMICAL CO., NEW YORK.

**PEROXIDE MAGNESIUM.** 20–30%  $MgO_2$ . A compound consisting of magnesium perhydroxide, magnesium hydroxide and constitutional water. The available oxygen averages 7 to 8%. Tasteless white powder. Soluble in acid medium. Suspended in water slowly dissociating its available oxygen.

—ROESSLER & HASSLACHER CHEMICAL CO., NEW YORK.

**PEROXIDE STRONTIUM.** 80 to 90%  $SrO_2$ . Averaging 12% available oxygen. Balance strontium hydroxide. Impalpable white powder, soluble in acid medium. Partly soluble in water. For bleaching oils and therapeutic purposes.

—ROESSLER & HASSLACHER CHEMICAL CO., NEW YORK.

**PEROXIDE ZINC.** 50 to 55%  $ZnO_2$ . Averaging 9% available oxygen. Balance zinc oxide and free moisture. A fine yellowish white color. Soluble in acid medium. Insoluble in water.

—ROESSLER & HASSLACHER CHEMICAL CO., NEW YORK.

**PHOSPHORIZERS.** Phosphorus chargers are used for introducing phosphorus into phosphor-bronze. Usually made of graphite. Are readily machined from solid Acheson graphite rods 99% pure graphite and in this case are free from the siliceous bond always present in the moulded article. Thus no injurious impurities are introduced and the carbon in this pure form aids in freeing the molten bath from oxide by reducing them.

—INTERNATIONAL ACHESON GRAPHITE CO., NIAGARA FALLS, N. Y.

**PICKLING VATS.** For brass foundries, platers and similar works, of especially thick and highly acid-proof stoneware material.

—J. W. SITIG, NEW YORK.

(Other stoneware makers see Stoneware.)

**PICKLING VATS.** Of stoneware for the use of wire drawers, brass foundries, etc., of cylindrical shape, made of the very best acid-proof clay and glazed with superior acid-proof glazing. Are extra thick and can be provided with faucet ground in if desired. Size to suit purchaser.

—U. S. STONWARE CO., AKRON, OHIO.

**PIPE.** Copper and brass pipe, also lead-lined and silver-lined copper, brass and iron pipe. Made by a patented process whereby the lining is fastened homogeneously to the outer covering so that it cannot possibly be detached. No plugs or rivets of any kind are used. This process makes the pipe far superior to such pipe in which the lining is only mechanically adhered to the covering. This

pipe can be used for all chemical purposes for which the material of the lining is suitable.

—E. B. BADGER & SONS CO., BOSTON, MASS.

**PIPE, ENAMELED STEEL.** Acid and alkali-proof pipe. Made of plate steel and coated with an enamel that is absolutely acid and alkali proof. All seams are welded and there are no riveted, bolted or packed joints. Pipe in all sizes from 2" to 54" for mines, metallurgical and chemical works. Suitable for acids, alkalies, fruit juices, milk, oils, volatile liquors or any liquors which are corrosive in their action. Pipe is entirely unaffected by electrolytic corrosion. Built for any pressure the steel will stand.

—THE ENAMELED PIPE & ENGINEERING CO., ELYRIA, OHIO.

**PIPE** for mines and cyanide plants. Manufacturers of a special wood pipe with copper banding for use in mines where the water contains acid. Also manufacturers of pipe for irrigation, power plants, city water systems, sewers. Pipes made from California redwood and Douglas fir.

—PACIFIC TANK & PIPE CO., SAN FRANCISCO, CAL., PORTLAND, ORE., LOS ANGELES, CAL.

**PIPE. LEAD-COVERED** pipes and coils of either brass, copper or iron.

—LEAD-LINED IRON PIPE CO., WAKEFIELD, MASS.

**PIPE. LEAD-LINED IRON PIPE.** In all sizes, either flanged or coupled, for any corrosive waters or acids. The lead lining on these pipes is fused onto the iron and the two metals cannot become separated, either by hot liquids or hard usage. Very largely used for pumping mine waters or salt water. Also for conducting all kinds of acids, hot or cold; for a hot acid a hardened lead is used. For pulp and paper mills we make a pipe that can be cut out to sketch, for either wrought iron, cast iron or spiral riveted pipe, flanged or screwed joints.

—LEAD-LINED IRON PIPE CO., WAKEFIELD, MASS.

**PIPE, RUBBER AND FITTINGS.** For conveying acids, alkalies, corrosive liquors, dyes, brine, etc.

—AMERICAN HARD RUBBER CO., NEW YORK.

**PIPES** of fused silica ware. All sizes. (See also Quartz, Fused in part II of this Dictionary.)

—THERMAL SYNDICATE, LTD., NEW YORK.

**PIPES.** Steam piping, valves, and accessories.

—PITTSBURGH VALVE, FOUNDRY & CONSTRUCTION CO., PITTSBURGH, PA.

**PIPE STONEWARE AND FITTINGS.** Flanged, conical flanged, or socket, made of acid-proof stoneware, in all sizes and lengths.

The pipes can also be had with a cast-iron mantle, making them very durable and strong.

—DIDIER-MARCH Co., NEW YORK.

**PIPES STONEWARE AND CONNECTIONS.** Graham chemical stoneware pipe is furnished in all sizes from  $\frac{1}{4}$ " to 48" inside diameter. Best and only safe material for handling corrosive liquids such as acids, alkalies, etc., as well as gases and acid fumes. Pipe provided for all kinds of joints (clay lute, water lute, flanged, etc.) Fittings of every variety such as elbows, tees, Y branches, traps, etc., to correspond. Warranted chemical proof.

—CHARLES GRAHAM CHEMICAL POTTERY WORKS, BROOKLYN, N. Y.  
(Other stoneware makers see Stoneware.)

**PIPE. STONEWARE.** Perfectly straight and round, made in any diameter and up to lengths of 118' in one piece; also branch pipes, tees, bends, etc.

—J. W. SITTIG, NEW YORK.

**PIPE. TIN-LINED IRON PIPE.** For house plumbing, where the water is conducted from springs; for carbonating plants, dairies, creameries, and wherever a superior pipe for conducting pure water is desired; also for wineries, for paraffine works, etc.

—LEAD-LINED IRON PIPE Co., WAKEFIELD, MASS.

**PIPES.** Water pipe lines complete with valves and fittings.

—PITTSBURGH VALVE, FOUNDRY & CONSTRUCTION Co., PITTSBURGH, PA.

**PIPE. WOOD "IMPROVED."** For conveying water and acids. Protected on the exterior by imperishable cement and preserved by the liquid which fills the pores of the wood in the shell, this pipe will last and remain in perfect condition practically indefinitely. Our "improved" wood mine and acid pipe resists the action of acids and alkali solutions and is especially suitable for mines, collieries, acid and alkali works, mineral waters, tanneries, distilleries, etc. We also make steam-pipe casings for covering steam pipes laid underground.

—MICHIGAN PIPE Co., BAY CITY, MICH.

**PIPE WELDING.** See Welding.

**PIPE.** Wrought iron and steel. All standard sizes and weights. Spiral riveted pipe, sizes 3" to 40" inside diameter in three weights. Forged steel flanges are used to join sections.

—PITTSBURGH VALVE, FOUNDRY & CONSTRUCTION Co., PITTSBURGH, PA.

**PIPING SYSTEMS.** Complete, for steam, water, or any service designed, built and erected—all sizes and pressures.

—PITTSBURGH VALVE, FOUNDRY & CONSTRUCTION Co., PITTSBURGH, PA.



**PITCHERS.** Graham chemical stoneware pitchers for handling acids, alkalis, etc., in every strength. Two styles made and all sizes from one pint to five gallons capacity. Ware guaranteed chemical proof. Pitchers can be furnished extra heavy or extra light at no increase of cost.

—CHARLES GRAHAM CHEMICAL POTTERY WORKS, BROOKLYN, N. Y.

**PITCHERS.** Stoneware acid pitchers are made in sizes to suit customers, from  $\frac{1}{2}$  gal. to 10 gals. capacity. Have a good, strong, properly shaped spout, are thoroughly glazed, and will hold acids without fear of contents percolating through the body of the pitcher. Are regularly made with one handle. Two handles if desired.

—U. S. STONWARE CO., AKRON, OHIO.

(Other stoneware makers see Stoneware.)

**PLACERS.** See Amalgamating Riffles.

**PLATINUM.** See second part of Dictionary, devoted to Measuring Instruments and Laboratory Supply.

**PLUMBAGO.** By proper selection of raw materials, graphites of widely different characteristics are produced in the electric furnace. This obviates the necessity of "doping" the graphite to impart certain properties for special purposes, a practice sure to result in loss of other valuable qualities. Hence the increasing popularity of electrically produced graphites for such purposes as dry battery filler, paint pigment for steel and iron, electrotyping leads, lubrication, either dry or mixed with oil or grease, powder glazing, pipe-joint compound, furnace linings, lamp-filament paste, stove polish, lead pencils, recarbonizing steel, foundry facings, and all electrical purposes.

—INTERNATIONAL ACHESON GRAPHITE CO., NIAGARA FALLS, N. Y.

**POLISH.** Victor white. For imparting a fine lustre to nickel-plated work.

—ZUCKER & LEVETT & LOEB CO., NEW YORK.

**POLISHING LATHE.** See Lathe.

**PORCELAIN JAR MILL.** See Crushing and Grinding, Jar Mill.

**PORCELAIN WARE.** For chemical purposes, of the Royal Berlin Factory and other well known manufacturers. Made in any form or size. Further particulars cheerfully furnished on application. This imported ware is known all over the world for its superior quality and great resistance against temperature.

—J. W. SITTIG, NEW YORK.

**POT MILL.** See Crushing and Grinding, Mill.

**POTS, JARS, TRANSPORTING VESSELS.** Of acid-proof stoneware, from 13 gal. to 528 gal. capacity, with and without outlets, in all shapes, conical, cylindrical or oval shape.

—**DIDIER-MARCH COMPANY**, NEW YORK.

(Other stoneware makers see Stoneware.)

**POTS** and vessels of fused silica ware. (See also Quartz, Fused, part II of this Dictionary.)

—**THE THERMAL SYNDICATE LTD.**, NEW YORK.

**POTASH.** American—Greenwich.

—**PENNSYLVANIA SALT MFG. CO.**, PHILADELPHIA, PA.

**POTASH. BICHROMATE OF POTASH.**

—**GENERAL CHEMICAL CO.**, NEW YORK CITY.

**POWDER JARS.** Of acid-proof stoneware, glazed inside and outside, with ground-in stoppers, in various capacities, from  $\frac{1}{4}$  gallon to 6 $\frac{1}{2}$  gallons capacity.

—**DIDIER-MARCH CO.**, NEW YORK.

(Other stoneware makers see Stoneware.)

**POWER TRANSMISSION Machinery.** Belt tighteners. Boxes Couplings, Gears, Hangers, Pulleys, Rope sheaves, Shafting.

—**ALLIS-CHALMERS CO.**, MILWAUKEE, WIS.

**POWER TRANSMISSION MACHINERY.**

—**SCAIFE FOUNDRY AND MACHINE CO., LTD.**, PITTSBURGH, PA.

**PRESSES.** *Machines for exerting or transmitting pressure by means of steam, pneumatic, hydraulic or other power, for the purpose of condensing or compressing various materials into various forms or shapes, and also for extracting liquids.*

**PRESS, AUTOMATIC CONTINUOUS SCREW.** This press is of a continuous screw type and consists of a horizontal tapered screw, built up on a hollow perforated shaft, arranged so as to allow of admitting steam to the material while under pressure, if desired. The screw fits closely inside of a similarly tapered slatted curb and rotates. The gradual decrease in size of the screw and its curb causes the pressure. Drainage is both internal and external. Suitable for handling offal from slaughter houses, fish plants and similar material.

—**AMERICAN PROCESS CO.**, NEW YORK.

**PRESS, FOOT LEVER, DOPP.** Manufacturers of two styles of foot presses, as used in pressing or stamping soap, toilet and various other articles, on which it is desired to put an impression. Their particular points of superiority are the lightness, strength of design, and the fact that the head and base are cast in one piece, and with the way in which the ram slides, having eight wearing surfaces, are

adjusted. This adjustment of the ram is easily effected by simple adjusting screws.

—SOWERS MFG. CO., BUFFALO, N. Y.

### **PRESSES, HYDRAULIC.**

—MACKINTOSH, HEMPHILL & CO., PITTSBURGH, PA.

**PRESS, LEAD CABLE, KRUPP HYDRAULIC.** A horizontal press (Huher Patent) by which all sizes of cables are covered with a suitable lead covering. The cables are fed through a hollow mandrel and the lead is pressed upon same by two hydraulic cylinders on opposite sides of the press. The hollow mandrel and matrice are situated in the middle of the lead cylinder. This type of press gives a more uniform thickness of lead coating than one can depend upon obtaining with presses having only one cylinder, and has a larger capacity per unit of cost than single cylinder presses.

—THOMAS PROSSER & SON, NEW YORK.

**PRESS, METAL, KRUPP HYDRAULIC.** For making round bars or bars of any section, of brass, aluminium, or other metals or metallic alloys. Owing to the simple locking means of the press, the latter can be rapidly charged with red-hot metal blocks and rapidly set into operation. The metal blocks do not get cool and the pressing operation takes place regularly. The press is a horizontal press having a double acting hydraulic cylinder. The use of this press is especially advantageous when sections are desired that cannot be rolled, and under any conditions a more compact product is obtained by pressing than by rolling.

—THOMAS PROSSER & SON, NEW YORK.

**PRESSURE REGULATORS.** Lummus Hydrostatic Pressure Regulators are compact machines, self-contained and positive in action. They will control pressures ranging from 100 to  $\frac{1}{4}$  lb. with a variation of not more than  $\frac{1}{4}$  oz. Especially adapted for use in connection with stills. Applicable, however, in any case where delicate pressure regulation is essential.

—WALTER E. LUMMUS, BOSTON, MASS.

**PRODUCER, GAS, MORGAN.** Continuous Gas. Highest economy attained, often saving 50 per cent of fuel and labor in the production of gas for roasting, refining, heating, and melting. The special feature is the automatic feed, which insures almost absolute uniformity of both quantity and quality of gas produced.

—MORGAN CONSTRUCTION CO., WORCESTER, MASS.

**PRODUCER GAS, WESTINGHOUSE.** A double-zone suction producer for bituminous coal. Uses to advantage good coal, and lignite, etc., of lower value, and produces a pure gas suitable for use in engines. For description and tests see *Metallurgical and Chemical Engineering*, Vol. 8, No. 3 (May 1910,) p. 159. Also up-draft suction producers for non-bituminous fuels.

—WESTINGHOUSE MACHINE CO., PITTSBURGH, PA.

**PRODUCERS, AMSLER,** for power. Made in both suction and pressure types. These use the Amsler producers and are provided with proper scrubbing devices. The governor keeps the water supply to the suction producers proportioned so that the gas is absolutely uniform. These producers are furnished in all sizes and for all grades of fuel, and to meet all conditions.

—WALTER O. AMSLER, PITTSBURGH, PA.

**Producer, Amsler Automatic Gas.** A power-operated, full automatic device for making gas continuously in large quantities from any coal. The producer is fed, poked, and cleaned automatically, by means of a very simple device. The coal-feeding member and the poking member are one and the fuel is "drilled" into the fuel bed in a manner similar to that employed in agricultural machinery for planting wheat. This member has an epicycloidal motion through the fuel to thoroughly agitate the fire and to properly distribute the coal. The coal is measured in an adjustable measuring device, and the ash is removed by an adjustable ash plow. The ash is dropped into an ash hopper from which it may be drawn at convenient intervals.

—WALTER O. AMSLER, PITTSBURGH, PA.

**Producer, Amsler, Hand-Operated.** For fuel gas is of simple and efficient construction. The few parts make it inexpensive to install and maintain. In operation it requires the minimum labor and will gasify any coal whatever without trouble from clinkers. The vertical sides, numerous poke holes, and the efficient air distributor make this possible.

—WALTER O. AMSLER, PITTSBURGH, PA.

**PULVERIZERS.** See Crushing and Grinding.

**PUMP.** Hard rubber piston and centrifugal pumps for acids, alkalis, corrosive liquors, dyes, brine, etc.

—AMERICAN HARD RUBBER CO., NEW YORK.

**PUMPS.** Chemical stoneware plunger pumps, single action. Capacity about 19 gallons per minute at 40 revolutions. Supplied complete with all iron work, including tight pulley, ready for operation. All working parts non-corrosive, being made from best vitrified stoneware. Blue print and price upon application.

—CHARLES GRAHAM CHEMICAL POTTERY WORKS, BROOKLYN, N. Y.

**PUMPS.** Of all kinds for hand, steam and electric power. Excellently adapted for use in chemical factories, as all parts coming in contact with the liquids are made of the best acid resisting stoneware. Centrifugal pumps for raising large quantities of acids. Vacuum pumps (see Catalog, p. 4).

—J. W. SITTING, NEW YORK.

**PUMPS, ACID.** H. & V. W. patent acid pump to replace all

previous crude contrivances, simple to operate and quick to act, reduces the danger of handling acids, to a minimum.

—HANSON & VAN WINKLE COMPANY, NEWARK, N. J.

**PUMPS, CENTRIFUGAL.** Of acid-proof stoneware, capacity up to 39,600 gallons per hour. Tested to 50% higher speed than listed.

—DIDIER-MARCH COMPANY, NEW YORK.

(Other stoneware makers see Stoneware.)

**PUMPS** for air or gas. See Blowers Piqua Positive.

**PUMPS FOR FLUIDS.** Vertical or horizontal plunger, made of acid-proof stoneware, hand power or belt drive to suit conditions, in various capacities, single or double cylinders.

—DIDIER-MARCH COMPANY, NEW YORK.

**PUMPS FOR GASES.** Plunger, made of acid-proof stoneware, for conveying gases, etc., in various sizes and capacities.

—DIDIER-MARCH COMPANY, NEW YORK.

**PUMPS, ROTARY.** Abbé-Frenier Sand Pump. Spiral type. This special rotary pump is simple in construction, cleanly in its operation and so built that it is not apt to become rapidly worn by abrasion. The pump is used for lifting sand and water in stone and marble sawing works, also for pulp, slime etc., in concentrating and cyanide plants.

—ABBE ENGINEERING CO., NEW YORK.

**PUMPS, ROTARY FORCE, DAY'S.** For pumping oil, paint, grease, acids and hot or cold water. Made for hand or power. Made in bronze for pumping acids and for hot liquids it is provided with a metallic check valve. It is made in various sizes having a capacity of 13 to 55 gallons per minute.

—J. H. DAY CO., CINCINNATI, OHIO.

**PUMPS, VACUUM ROTARY.** See also Blowers Piqua Positive.

**PUMPS, VACUUM ROTARY.** The Abbé Rotary vacuum pump is built in such a way that the blades or gates are in constant contact with the casing or cylinder. The shaft is set eccentric and carries the drum, which in turn receives the blades or gates and permits them to slide back and forth as it revolves. This pump is built in various styles and sizes to meet different requirements.

—ABBE ENGINEERING CO., NEW YORK.

**PUMPS, VACUUM.** Single, two stage, three stage, horizontal or vertical, steam, belt or motor driven. Any size or capacity. Of an improved design. The valves remain on their seats without the use of springs. The highest obtainable vacuum guaranteed on all our pumps. All parts are adjustable and complete. All pumps built on the straight line principle, thereby doing away with neces-

sity of placing rocker arms and various devices for moving the valves, etc., as these are all done away with on our pumps.

—BUFFALO FOUNDRY & MACHINE CO., BUFFALO, N. Y.

#### **PUMPING ENGINES.**

—ALLIS-CHALMERS CO., MILWAUKEE, WIS.

**PUMPING MACHINERY.** Centrifugal pumps. Elevator pumps. Fire service pumps. Geared pumps. "High-duty" pumping engines. Hydraulic transmission pumps. Mine pumps. Multi-stage, high-lift centrifugals. Screw pumps. Allis-Chalmers pumping machinery, reciprocating and centrifugal, is of highest economy. Every unit is built specially for the service required and for the capacities and heads. Maximum efficiency and durability.

—ALLIS-CHALMERS CO., MILWAUKEE, WIS.

**PUMPING SYSTEM, FUEL OIL.** For pumping oil from storage tank to burners. Heats the oil with the exhaust steam. Delivers it to burners under uniform pressure. Will handle light or heavy oils. In no way governed by gravity. Absolutely safe. Approved by underwriters. Simplest and best system made. 5 sizes—100, 200, 300, 500 and 900 gallons capacity per hour. Catalog 3.

—W. S. ROCKWELL COMPANY, NEW YORK.

—ROCKWELL FURNACE CO., NEW YORK.

#### **PUMPING SYSTEM, FUEL OIL.**

—MONARCH ENG. & MFG. CO., BALTIMORE, MD.

#### **PUNCHES.**

—MACKINTOSH, HEMPHILL & CO., PITTSBURGH, PA.

**PURPLE ORE.** Blue billy, containing over 68% metallic iron free from phosphorous.

—PENNSYLVANIA SALT MFG. CO., PHILADELPHIA, PA.

**PYRITIC SMELTING.** See Hot-blast Stoves.

**QUARTZ, FUSED.** See part II of this dictionary.

**RAIL JOINTS, THERMIT WELDING.** See Welding.

"**RAPID DISSOLVER.**" See Dissolver.

**RARE MINERALS AND ORES.** See Ores and Rare Minerals.

**RAYMOND MILL.** See Crushing and Grinding.

**REAGENTS.** Chemically pure. Full particulars and prices on request.

—THE BAKER & ADAMSON CHEMICAL CO., EASTON, PA.

**REAGENTS.** "Baker's Analyzed Chemicals." Every label shows an analysis, and our guarantee provides that the contents of each bottle will conform with that analysis.

—J. T. BAKER CHEMICAL CO., PHILLIPSBURG, N. J.

**REAQENTS.** "Let Merck make the "Blank" Test for you. To that end buy Merck's Blue Label Reagents."

—MERCK & CO., NEW YORK, ST. LOUIS, RAHWAY, N. J.

**RECTIFIER ELECTRODE.** In conjunction with aluminium as used in cells for rectifying alternating current, solid graphite electrodes show advantage over the elements heretofore used, in that they minimize the heating effect. In mercury rectifiers also pure graphite electrodes are used as anodes. Made at a temperature of 7500° F., they are free of all volatile matter.

—INTERNATIONAL ACHESON GRAPHITE CO., NIAGARA FALLS, N. Y.

**RECTIFYING COLUMNS** of various sizes for acetic acid, formaldehyde, etc., with sieve plates ground to fit supporting rings.

—DIDIER-MARCH CO., NEW YORK.

(Other stoneware makers see Stoneware.)

**RED OXIDE OF COPPER.**

—PRIMOS CHEMICAL CO., PRIMOS, PA.

**REDUCTION MACHINERY.**

—THE SALT LAKE HARDWARE CO., SALT LAKE CITY, UTAH.

**REFINING EQUIPMENT.** Machinery and appliances for the desilverization of base bullion. Cupelling furnaces. Copper, converters. Furnaces for melting precipitates in the cyanide and other processes. Retort furnaces for amalgam.

—COLORADO IRON WORKS CO., DENVER, COLO.

**REFINING FURNACES.** See Furnace, Refining and Furnaces Electric.

**REFRACTORIES.** *Divided for general purposes into three classes, acid, basic, neutral. Silica is the typical acid refractory; lime, magnesia, dolomite, bauxite, are typical basic refractories. Carbon (graphite) and chromite are neutral. See Brick; see also Carbon, Carborundum, Graphite and Chrome Ore.*

**REGENERATIVE FURNACES.** See Furnaces Regenerative.

**REINFORCING RODS—WELDING BY THERMIT PROCESS.**

The operation is in all particulars identical with that of pipe welding, which see.

—GOLDSCHMIDT THERMIT CO., NEW YORK.

**RESISTANCE ALLOYS.** Made in wire and ribbon form. For use in rheostats and heating devices. See Wire.

—DRIVER-HARRIS WIRE COMPANY, HARRISON, N. J.

**RESISTANCE WIRE, KRUPP'S.**

—THOS. PROSSER & SON, NEW YORK.

(See also Wire.)

**RESISTORS, ELECTRICAL.** *Materials used for controlling and regulating electrical current.*

**RESISTOR, GRANULAR CARBON.** When granular carbon is used for high temperatures, electric furnace graphite is desirable because of its high purity and infusibility. It is easily granulated and graded, and since it has been raised to the highest attainable temperature during manufacture, its resistivity is not permanently altered by successive heatings. Made in various degrees of hardness, all pure graphite. Peculiar non-arcing properties reduce variation to a minimum.

—INTERNATIONAL ACHESON GRAPHITE CO., NIAGARA FALLS, N. Y.

**RESISTORS, KRUPP RESISTANCE WIRE AND MATERIAL.**

For rheostats, arc lamps, heating apparatus, moving picture machines, etc. This is the original high-resistance material and has a specific resistance only about 10% lower than mercury. It is a special high-grade nickel-steel showing a high resistance and may be loaded permanently up to a temperature of 600° Centigrade (1112° Fahrenheit) without undergoing any alteration of structure.

—THOMAS PROSSER & SON, NEW YORK.

**RETORT FURNACES.** See Furnaces, Retort.

**RETORTS AND OVENS.** For wood distillation. Hand charged and "Jumbo" types. Careful study of heat regulation and its distribution and circulation within retort has led to new and efficient designs.

—WALTER E. LUMMUS, BOSTON, MASS.

**RETORTS.** Samsom Retorts, with hinged drop bottom, fastened with clamps, for chemical and other uses where contents are to be solidified and then forced out of the bottom. Golden Crown Retorts, porcelain-lined, for dentists, chemists, physicians, etc. Vienna-Vacuum Retort, porcelain-lined.

—STUART & PETERSON CO., BURLINGTON, N. J.

**RETORTS OF STONE-WARE.** With ground in stoppers.

—J. W. SITTING, NEW YORK.

(Other stoneware makers see Stoneware.)

**REVERBERATORY FURNACES.** See Furnaces, Reverberatory.



**RHEOSTATS.** Tank rheostats, H. & V. W. Underwriters patent, for controlling the current flowing in to the tanks, made in many sizes to suit requirements, especially for electroplaters.

—THE HANSON & VAN WINKLE CO., NEWARK, N. J.

**RHEOSTATS.** Very nice gradations in ohmic resistance can be maintained by varying the pressure put upon a pile of discs or washers machined from solid Acheson graphite rods, inserted in the electric circuit. The discs may be held in insulating tubes, or the washers centered on an insulating rod, and variable pressure applied by means of a cam. Uniformity, non-arcing and infusible properties, as well as resistance to oxidation and economy of machining are valuable adjuncts.

—INTERNATIONAL ACHESON GRAPHITE CO., NIAGARA FALLS, N. Y.

**RIVETTERS.**

—MACKINTOSH, HEMPHILL & CO., PITTSBURGH, PA.

**RIVET FURNACES.** See Furnaces, Rivet.

**ROASTING AND NON-ROASTING.** See also "Cyanide Process."

—THE MOORE FILTER CO., NEW YORK.

**ROASTING FURNACES.** See Furnaces, Roasting.

**ROASTING FURNACE BLOWERS.** See Blowers, Piqua Positive.

**ROASTING PLANTS.** For sulphide and arsenical ores, etc. Reverberatory hand roasting, furnaces. Mechanical roasting furnaces.

—COLORADO IRON WORKS CO., DENVER, COLO.

**ROLLERS, RUBBER COVERED.** As the originator of rubber-covered rollers, this firm makes a specialty of furnishing such rollers complete and also recovering rollers with rubber. The use of a proper consistency of high grade rubber, which our long experience has shown to be best adapted for specific purposes, produces results not otherwise obtainable. Rubber covered rollers of our manufacture are used with perfect satisfaction for sheet iron galvanizing.

—BOSTON BELTING COMPANY, BOSTON, MASS.

**ROLLING MILLS.** Blooming mills. Universal mills for slabs or plates. Structural mills. Rail mills. Plate mills. Sheet and tin plate mills. Merchant mills.

—MACKINTOSH, HEMPHILL & CO., PITTSBURGH, PA.

**ROLLING MILL ENGINES.**

—ALLIS-CHALMERS CO., MILWAUKEE, WIS.

**ROLLING MILL PINIONS.**

—MACKINTOSH, HEMPHILL & Co., PITTSBURGH, PA.

**ROLLS.** Steel casting rolls of all sizes.

—MACKINTOSH, HEMPHILL & Co., PITTSBURGH, PA.

**ROLLS, RUBBER COVERINGS.** A perfect union between the rubber cover and the iron roll, with freedom from blisters and soft spots, true surface, exact crowning and correct density. For paper mills, leather factories, bleacheries, printing and dye works, etc.

—REVERE RUBBER Co., BOSTON, MASS.

**ROLLS, Crushing.** See also Crushing and Grinding, Rolls.

**ROPE PULLEYS.**

—MACKINTOSH, HEMPHILL & Co., PITTSBURGH, PA.

**ROTARY CRUSHER.** See Crushing and Grinding.

**ROTARY CUTTER.** See Cutter.

**ROTARY DRYER.** See Dryer Rotary.

**ROTOPLATER.** A revolving automatic plating apparatus, consisting of a wooden tank, in which is inserted a revolving non-metallic hexagon cylinder containing the articles to be plated. The rotation of the cylinder polishes the work while it is being plated. Made in different types and sizes.

—ZUCKER & LEVETT & LOEB Co., NEW YORK.

**RUBBER.** See also "Belting," "Gaskets," "Hose," "Mats," "Packings," "Rollers," "Springs," "Tubing," "Valves."

**RUBBER GOODS, MECHANICAL.** The original and largest manufacturers of all classes of high grade rubber goods for mechanical and manufacturing purposes.

—BOSTON BELTING COMPANY, BOSTON, MASS.

**RUBBER GOODS.** For mechanical use. "The policy of this company is to make only the highest grades of mechanical rubber goods. In the manufacture of these goods we use the finest grades of rubber, the latest improved and special machinery of our own design, and our experience, dating back to the infancy of the rubber industry."

—REVERE RUBBER Co., BOSTON, MASS.

**RUBBER SOLUTION MACHINE.** See Solution Machine, Rubber.

**SAL AMMONIAC.** Muriate of ammonia. For galvanizing and annealing. White and gray. Coarse and fine.

—THE GRASSELLI CHEMICAL Co., CLEVELAND, OHIO, CHICAGO, ILL. AND NEW YORK.

**SAL SODA.**

—PENNSYLVANIA SALT MFG. CO., PHILADELPHIA, PA.

**SALT.** Wyandotte.

—PENNSYLVANIA SALT MFG. CO., PHILADELPHIA, PA.

**SALT CAKE.** Refined for glass makers.

—PENNSYLVANIA SALT MFG. CO., PHILADELPHIA, PA.

**SAMPLING MACHINERY.** Automatic samplers for mill and smelter use. Sampling crushers, rolls and sample grinders.

—COLORADO IRON WORKS CO., DENVER, COLO.

**SAWS,** Hot and Cold.

—MACKINTOSH, HEMPILL & CO., PITTSBURGH, PA.

**SAWDUST BOXES.** See Drying.

**SAW MILL MACHINERY.** Of the most improved design. A pioneer builder of Saw Mill Machinery.

—ALLIS-CHALMERS CO., MILWAUKEE, WIS.

**SCALE REMOVER.** Tri-sodium phosphate for softening water. Removes scale and prevents incrustations in boilers.

—THE GRASELLI CHEMICAL CO., CLEVELAND, OHIO, CHICAGO, ILL., AND NEW YORK.

**SCHEELITE.** Calcium Tungstate. Concentrates, guaranteed 65% tungstic acid minimum; shipments (1000 tons) have averaged over 70%  $WO_3$ . For the manufacture of tungsten metal, ferro-tungsten, tungsten-lamp filaments, and tungsten salts.

—ATKINS, KROLL & CO., SAN FRANCISCO, CAL.

**SCREEN, IMPACT.** This excellent mill screen has effectually solved the problems of wet and dry screening between one-half inch and one hundred mesh, having immense capacity and producing almost absolutely clean products. Concerning the valuable patented features upon which its high efficiency depends, see Pamphlet 9-B.

—COLORADO IRON WORKS CO., DENVER, COLO.

**SCREEN, NEWAYGO.** For all dry sizing from  $\frac{1}{2}$ " to 200 mesh, single separator producing one to four products. Largely used for cement, limestone, ore, phosphate, chemicals, etc. Specially stretched screening surface, automatically tapped by hundreds of little hammers, giving rapid vibration. Coarse wire used to obtain fine output, on account of the inclination of the screening surface, thus 20 mesh cloth produces 40 mesh product.

—STURTEVANT MILL CO., BOSTON, MASS.

**SCREENS.** REVOLVING screens. Shaking screens.

—ALLIS-CHALMERS CO., MILWAUKEE, WIS.

**SCREENS, REVOLVING.** Cylindrical and conical revolving screens or trommels. Octagonal revolving screens. The impact screen. Hydraulic and mechanical classifiers and sizers.

—COLORADO IRON WORKS CO., DENVER, COLO.

**SCREENS, REVOLVING, DAY'S SUPERIOR.** Made to screen clay, sand, fertilizer, etc. It consists of a steel shaft with arms reaching out to the circumference. To these arms are attached the iron bands and frame which hold the wire cloth. The feed end has a flange to prevent a back flow of material. Operated on a slight incline.

—J. H. DAY CO., CINCINNATI, OHIO.

**SCREENS, RUTHENBURG.** Made of solid wedge steel rings for screening fines from coarse crushings without wear. Rock breaker breaking to 1" cube, gives 20% through 30 mesh screen. Coarse roll set to  $\frac{1}{4}$ " gives 45% through 30 mesh. Why crush further making slime?

—MARCUS RUTHENBURG, LONDON.

**SCREENS, TON-CAP.** A slotted wire screen of special construction, having larger air space or discharge area than other types of screen. A larger tonnage of material can be passed through ton-cap screen than with any other type. Catalog 28.

—THE W. S. TYLER COMPANY, CLEVELAND, OHIO.

**SCREENS, VIBRATING.** For screening mineral, clay, sand, fertilizer and other material of similar nature. Intended for heavy work. The sifting is done by a vibrating or shaking movement. The sifting box is mounted on rollers and the vibrating motion is imparted by a large eccentric. The frame in the bottom containing the sieve cloth is removable. Made in three sizes with sieve 24 x 48, 24 x 72 and 24 x 96 inches. Also made with a feeding attachment when required.

—J. H. DAY CO., CINCINNATI, OHIO.

**SCREENS, Wire.** The Tyler "double crimped" square mesh wire cloth, or the slotted ton-cap screens. Made in any mesh and from all commercial metals.

—THE W. S. TYLER COMPANY, CLEVELAND, OHIO.

**SEMISTEEL CASTINGS.** See Castings, Semisteel.

**SEPARATOR.** Air separation, for grinding mills. See also Crushing and Grinding, Raymond Mill.

**SEPARATOR, BLAST.** A machine used for separating pulverized materials by means of an air blast, instead of by screening or bolting. The pulverized material as it comes from the mills is fed to the machine, and the air blast regulated so as to blow out the material of the required degree of fineness, while the coarse particles are returned to the

*mill for re-grinding. The grinding efficiency of any mill is greatly increased by the use of a separator, as it takes the material from the mill as fast as it is ground and removes the finished product, thus saving the mill from doing unnecessary work on finished material.*

**SEPARATOR, OSBORNE PNEUMATIC BLAST.** The pulverized material being fed to the machine falls upon a rotating disc which scatters the material into the air blast. The area of the machine and the strength of the air blast are regulated so as to carry off only the material of the required degree of fineness, while the coarse material drops out at the bottom of the separator to be returned to the mill for re-grinding. The fine material is blown into the dust collector and there separated from the air. The dust passes out through the bottom of the collector, while the air returns to the fan to be used over again. This forms a closed circuit, and by using the same air over and over, prevents the escape of any dust. The volume of air used remains practically constant, no matter what grade of material is being separated, which insures large capacities even on very fine materials. These separators will deliver from  $3\frac{1}{2}$  to 10 tons per hour of finished product that will screen 95% 100 mesh fine. Material can be separated up to 200 mesh fine.

—GRISCOM-SPENCER Co., NEW YORK.

**SEPARATOR, MAGNETIC.** See Magnetic Separators.

**SEPARATOR, VACUUM.** *An apparatus for separating pulverized materials by means of an air current working on an exhaust or vacuum. The pulverized material from the mill or grinder is fed to the machine and the air current is regulated to suck out the material of the required degree of fineness, and allow the coarse particles to return to the mill for re-grinding. Vacuum separators use the same medium as blast separators for effecting the separation, namely air, but they operate on a directly opposite principle.*

**SEPARATOR, OSBORNE VACUUM.** In this machine the material falls on a revolving disc which scatters it and allows it to roll down the surface of a deflecting cone. As the material slides over the edge of this cone it is caught up by the suction of the air, and the finer particles drawn through the fan and discharged into the dust collector, while the heavier particles fall to the bottom of the machine to be returned to the mill for re-grinding. This type of machine is adapted for attaching to high speed mills, thereby forming a suction in the mill and relieving same of its excess of air, and thus preventing the escape of the dust which is so often a source of annoyance in the grinding room. It will separate material to any degree of fineness desired up to 200 mesh fine.

—GRISCOM-SPENCER Co., NEW YORK.

**SEPARATOR.** Scaife patent automatic trough washer. For separating coal from slate, metallic sweepings from refuse, clay material and rock from ores, etc. See also under "Washer."

—SCAIFE FOUNDRY AND MACHINE Co., LTD., PITTSBURGH, PA.

**SEWER MACHINES.**

—THE BROWN HOISTING MACHINERY CO., CLEVELAND, OHIO.

**SHEARS.** Plate shears. Bloom shears, hydraulic or motor driven. Billet shears. Scrap shears. Shears of all designs for heavy work.

—MACKINTOSH, HEMPHILL & CO., PITTSBURGH, PA.

**SHELLS, SEAMLESS STEEL, COLD DRAWN.** See Tanks, seamless steel.

**SIEVES, TESTING, TYLER STANDARD.** For use in the screen analysis of any product. The cloth is square in mesh, made from the same gauge wire both ways and the sieves are of special construction. They can be supplied from 2 to 200 mesh and from 6" to 12" diameter. Nested or telescope and with or without pan and cover.

—THE W. S. TYLER COMPANY, CLEVELAND, OHIO.

**SIFTER AND MIXER, HUNTER'S LIGHTNING.** Made in many sizes and forms for various use, either for hand or for power, with or without steam jacket. Sieves interchangeable.

—J. H. DAY CO., CINCINNATI, OHIO.

**SILICA BRICK.** See Brick, Silica.

**SILICA CEMENT.**

—HAREISON-WALKER REFRACATORIES CO., PITTSBURGH, PA.

**SILICA, FUSED.** See Part II of this Dictionary under Quartz, Fused.

**SILICO-CHROMIUM.** Our alloy contains 10% silicon, 50% chromium, 4% carbon, for use in the manufacture of high-speed steels, etc.

—C. W. LEAVITT & CO., NEW YORK.

**SILICO-COPPER.** 10%, 15% and 25% silicon. Used principally as a flux or deoxidizer for making pure copper castings. Its action is more vigorous and pronounced than phosphorus. Produces solid castings of copper and tin bronze, free from blowholes.

—ELECTRIC SMELTING & ALUMINUM CO., LOCKPORT, N. Y.

**SILICO-MANGANESE-ALUMINUM.** A very valuable deoxidizing agent for iron and steel work in the armor plate work and steel of that nature.

—C. W. LEAVITT & CO., NEW YORK.

**SILICO SPIEGEL, SILICO MANGANESE AND SPIEGELEISEN.**

—C. W. LEAVITT & CO., NEW YORK.

**SILICON.** A metallic crystalline body of dark silver lustre. Compared with metals, it is quite brittle and has a hardness between 6 and 7. Specific gravity 2.34. Melting point 1,430°. Heat of oxidation 215,692. Silicon metal is made in three grades carrying 90%, 95% and 97% silicon respectively. The principal impurities are iron and aluminium. It carries about 0.20 carbon and is free from phosphorous and sulphur. Its principal use is in the refining of steel where it replaces the higher grades of ferro-silicon, being added directly to the ladle. It is a very powerful deoxidizing agent. Silicon is also used as a reducing agent in the manufacture of ferro alloys and is cast into rods for a manufacture of electrical resistances. Silicon is also used as a wireless detector.

—CARBORUNDUM COMPANY, NIAGARA FALLS, N. Y.

**SILICON.** Metallic Silicon.

—ELECTRIC SMELTING & ALUMINUM Co., LOCKPORT, N. Y.

—ROESSLER & HASSLACHER CHEMICAL Co., NEW YORK.

**SILICON.** See also Ferrosilicon.

**SILICON-CALCIUM-ALUMINIUM.** Our alloys contain 47 to 57% silicon, 15 to 25% calcium,  $2\frac{1}{2}$  to  $6\frac{1}{2}$ % aluminium, and is of value both as a deoxidizing agent and for the desulphurization of iron and steel mixtures.

—C. W. LEAVITT & Co., NEW YORK.

**SILICON-COPPER.**

—GEO. G. BLACKWELL, SONS & Co., LIVERPOOL, ENGLAND.

**SILICON-COPPER** alloy for copper and brass foundries.

—E. J. LAVINO & Co., PHILADELPHIA, PA.

**SILVER-BRONZE.** An alloy containing about 18% of manganese, having four times the electrical resistance of German Silver.

—ELECTRIC SMELTING & ALUMINUM Co., LOCKPORT, N. Y.

**SILVERITE ANODES.** See Anodes, Silverite.

**SINGEING FURNACES.** See Furnaces, Singeing.

**SINKS.** Of acid-proof stoneware. for laboratories, hospitals, physical and bacteriological institutions in various sizes and styles.

—DIDIER-MARCH COMPANY, NEW YORK.

(Other stoneware makers see Stoneware.)

**SLIME FILTER.** Exclusive owners of the Moore Process. Fine grinding (all-slimes) is not the universally adopted method of ore treatment, and the old leaching method has been revolutionized.

—THE MOORE FILTER Co., NEW YORK.

**SLIME TREATMENT MACHINERY.** Akins classifier, for separating sands from slimes. Rothwell continuous slime thickener,

for removal of surplus water or solution. Portland rotary continuous filter. Portland agitation tank for the treatment of pulp by the cyanide process. Silberhorn pneumatic agitator for the agitation and aeration of slimes in cyanide solution.

—COLORADO IRON WORKS CO., DENVER, COLO.

**SLIMING.** See "Filter. Slimes."

—THE MOORE FILTER CO., NEW YORK.

**SMELTING FURNACES.** See Furnaces, Smelting.

**SMELTING FURNACE BLOWERS.** See Blowers, Piqua Positive.

**SMOKE CONSUMER.** *An apparatus in which the gases from furnaces, etc., are passed through the machine for the purpose of removing the solid matter contained in them, and for purifying the gases as much as possible. Largely used for power plants and chemical works for collecting solid matter contained in the gases. See also "Dust Collector" "Gas Washer."*

**SMOKE CONSUMER, OSBORNE.** Will remove the gases from any type of furnace, etc., and by means of the water sprays in the machine will collect practically all of the solid matter contained in them, while the soluble gases will be reduced to solution, thereby allowing the gases escaping into the atmosphere to be practically free from all impurities. This type of machine may also be used for the collection of very fine dust in cases where the regular type of dust collector will not collect a sufficiently large percentage of the material.

—GRISCOM-SPENCER CO., NEW YORK.

**SOAP MACHINERY.** Dopp. A complete line of soap machinery. Kettles for boiling and saponifying, crutchers, tanks, soap frames, soap and lye pumps, chippers, cutting tables, slabbers, soap presses, soap grinders, and whatever else is required for the manufacture of toilet soap, laundry soap, textile soap and sand soap. Prepared to supply designs and estimates for complete plants.

—SOWERS MFG. CO., BUFFALO, N. Y.

**SODAS.** Sulphate, calcined sulphate, bichromate, bi-sulphate, liquid bisulphite, sulphite, sulphide crystals, concentrated sulphide, acetate, hyposulphite, silicate, caustic and sal sodas, trisodium phosphate, glassmakers' salt cake, glauber's salt, and nitre cake.

—GENERAL CHEMICAL CO., NEW YORK CITY.

**SODA ASH.**

—GENERAL CHEMICAL CO. OF PENNA., PITTSBURGH, PA.

—PENNSYLVANIA SALT MFG. CO., PHILADELPHIA, PA.

**SODA ASH.**

—THE SOLVAY PROCESS COMPANY, SYRACUSE, N. Y.



**SODA CRYSTALS.** Sesquicarbonate and monohydrate.

—THE SOLVAY PROCESS COMPANY, SYRACUSE, N. Y.

**SODIUM.** Metallic: Produced by electrolysis.

—ROESSLER & HASSLACHER CHEMICAL CO., NEW YORK.

**SODIUM NITRATE.**

—PENNSYLVANIA SALT MFG. CO., PHILADELPHIA, PA.

**SODIUM PEROXIDE.** See Oxone.

**SOFT-METAL FURNACES.** See Furnaces, Soft-metal.

**SOLDERING FLUX.** Liquids and crystals.

—THE GRASSELLI CHEMICAL CO., CLEVELAND, OHIO, CHICAGO, ILL.,  
AND NEW YORK.

**SOLUTION MACHINE, RUBBER.** Built in sizes of 20 and 50 gallons, capacity. The machine is chiefly used for dissolving India rubber, and is for this purpose equipped with two speeds, fast and slow as well as with air-tight cover so as to prevent loss of solvent. The bearings of the agitators are provided with stuffing boxes, which can be easily attended to.

—WERNER & PFLEIDERER, SAGINAW, MICH.

**SPITZKASTEN.** For the separation and sizing of granular pulp suspended in water.

—COLORADO IRON WORKS CO., DENVER, COLO.

**SPRAY NOZZLES.** For injecting water in chambers of sulphuric acid plants, absorbing gases, cooling gases, collecting dust, atomizing liquids, ventilating, re-cooling water, spraying oil on wood, suppressing suds on paper machines, humidifying cement and fire-clay, washing crude oil in refineries, atomizing liquid lead. The Koerting centrifugal spray nozzles are made of iron, brass, glass, lead, platinum hard rubber, etc. Manufacturers catalogs AA-6, BB-6 and CC-6 give detailed illustrated description of these spray nozzles and their various applications.

—SCHUTTE & KOERTING CO., PHILADELPHIA, PA.

**SPRINGS, RUBBER.** Springs of any shape and size, of various consistencies of stock, which are adapted for use in connection with all purposes for which rubber springs are employed.

—BOSTON BELTING COMPANY, BOSTON, MASS.

**STAMP MILLS.** Stamp mills or mills for any combination process according to the most modern ideas. Design and erection of complete milling and smelting plants. A very large and complete ore testing plant in operation. Catalog No. 6-C on Stamp Milling Machinery.

—COLORADO IRON WORKS CO., DENVER, COLO.

**STEAM ENGINES, CORLISS.**

—ALLIS-CHALMERS CO., MILWAUKEE, WIS.

**STEAM ENGINES—WESTINGHOUSE.** Vertical, single-acting steam engines, non-condensing and compound. These machines are built ruggedly and will stand severe service with minimum attention.  
—WESTINGHOUSE MACHINE CO., PITTSBURGH, PA.

**STEAM ENGINEERING SPECIALTIES.**

—SCHUTTE & KOBRTING CO., PHILADELPHIA, PA.

**STEAM PIPES.** See Pipes.

**STEAM SEPARATORS. ATWOOD.** For removing water, oil, etc., from steam. The flowing steam impinges on a ribbed baffle plate and changes its direction while the water is checked and drops into a receiver below. Standard Atwood horizontal, vertical and angle separators are built with cast-iron bodies and wells. The receiver type of separator is used in the live steam line when it is desirable to have an additional storage capacity for steam at a point near the engine. Large sizes of these are made of heavy riveted or welded steel plates. Standard working pressure 250 lbs.

—PITTSBURGH VALVE, FOUNDRY & CONSTRUCTION CO., PITTSBURGH, PA.

**STEAM TRAP. ATWOOD.** A device to drain the low points of steam lines and prevent the accumulation of water which when cool will make water-hammer and otherwise interfere with satisfactory operation. The Atwood trap is of "full-flow" type, with consequent large capacity. It operates only when the bucket drops, thereby eliminating any wire drawing to cut the valve seats. All valves removable for inspection without breaking a joint and all working parts without disturbing a pipe. No floats, diaphragms or stuffing boxes.

—PITTSBURGH VALVE, FOUNDRY & CONSTRUCTION CO., PITTSBURGH, PA.

**STEAM TURBINES.** See Turbines, Steam.

**STEEL CASTINGS.** Special for chemical works. See also castings, Chemical.

**STEEL CASTINGS BY THE THERMIT PROCESS.** In foundries where it is of importance to occasionally make a steel casting in a hurry, the thermit process offers a ready means of doing so by burning down the necessary quantity of thermit with an admixture of steel punchings. This, when ignited in the crucible, can be readily poured into molds of properly refractory material.

—GOLDSCHMIDT THERMIT CO., NEW YORK.

**STEEL FURNACES.** See Furnace, Electric Steel.

**STEEL, SPECIAL.** For experimental purposes, steel of any grade can be made by means of the thermit reaction, which develops sufficient heat to thoroughly melt up small portions of even the most highly refractory metals. The thermit steel being practically free from carbon, can be changed to high carbon steel by the addition of cast iron shot and offers a ready means of experiments on a small scale. Thermit can be obtained in 50 and 100 lb. drums.—**GOLDSCHMIDT THERMIT CO., NEW YORK.**

**STILLS.** Automatic, continuous and periodic stills for alcohol, rum, whiskey, solvent recovery, etc., these being designed for each particular case; also special stills for various industries such as the manufacture of wood and methyl alcohol, acetic acid, chloroform, ether, witch hazel, benzine, turpentine, acetone, carbon bisulphide, etc. Stills constructed of copper, silver, lead, silver-and lead-lined copper, iron, etc.—**E. B. BADGER & SONS CO., BOSTON, MASS.**

**STILLS.** Manufactured in all sizes and capacities for manufacture and recovery of alcohol and solvents of all descriptions. Made from copper, brass, cast iron, steel plate, etc., to suit service required and designed for economical and convenient operation. Lead and block-tin lined if desired.—**BAEUEERLE & MORRIS, PHILADELPHIA, PA.**

**STILLS.** With flanged rim or socket rim, all made of acid-proof stoneware, in various sizes and shapes.—**DIDIER-MARCH COMPANY, NEW YORK.**

**STILLS.** In various sizes. Made of best vitrified stoneware, guaranteed proof against action of nitric, muriatic and sulphuric acids, chlorine, etc. For use in distillation of corrosive compounds.—**CHARLES GRAHAM CHEMICAL POTTERY WORKS, BROOKLYN, N. Y.**

**STILLS.** Periodic and continuous distilling apparatus of modern design, of any size and material to meet ordinary as well as special requirements. For alcohol, turpentine, petroleum, oils, acetic acid, fusel oil, solvent recovery, etc. See Distilling Machines.—**WALTER E. LUMMUS, BOSTON, MASS.**

**STILLS.** Of stoneware, or made of cast iron coated with acid proof enamel.—**J. W. SITTING, NEW YORK.**

**STILLS.** Copper or iron. With surface or worm condensers all sizes from 5 gallons upward.—**F. J. STOKES MACHINE CO., PHILADELPHIA, PA.**

**STILLS.** In all sizes. Portable stills for laboratory and experimental work. Stills, without or with mixers, for large-scale industrial work. Catalog 216.—**STUART & PETERSON CO., BURLINGTON, N. J.**

**STILLS, WATER.** Automatic and multiple-effect water stills in all sizes; small stills for house use with block-tin lined still and condensing coil, heated by steam or fire. Larger automatic steam heated stills for laboratories, hospitals, etc., whereby a constant supply of distilled water is maintained with no attendance whatever. Also stills in a single or multiple effect for steamships, etc.

—E. B. BANGER & SONS CO., BOSTON, MASS.

**STILLS, WATER.** Distilled water apparatus of all sizes and capacities for laboratory and industrial uses. Apparatus to operate under a vacuum with a minimum amount of steam, made from steel plate, sheet copper tinned or block tin.

—BAEUEERLE & MORRIS, PHILADELPHIA, PA.

**STILLS, WATER.** Sargent's Automatic. A well-balanced apparatus for the continuous production of distilled water for laboratory or domestic use where a high degree of purity is desired at a minimum cost. Made in two sizes to produce  $\frac{1}{2}$  and 1 gallon per hour. Equipped with gas or gasoline burners or with steam coil. Also automatic stills heated by steam only having capacities of 5 gallons per hour up to any capacity required.

—E. H. SARGENT & CO., CHICAGO, ILL.

**STILLS, WATER, AUTOMATIC.** An automatically fed steam-operated water still in capacities from five to one hundred gallons an hour. By a patented construction the steam generated is used for heating the feed water to the boiling point before it is supplied to the still, so that a minimum of heat is required to operate it and by this preliminary heating of the feed water ammonia is largely eliminated from the distilled product. The cost of producing one gallon of distilled water varies from  $\frac{1}{4}$  to  $\frac{1}{2}$  cent.

—F. J. STOKES MACHINE CO., PHILADELPHIA, PA.

**STILLS, WATER.** Multiple effects for economically producing pure water for industrial or drinking purposes, or for manufacture of ice. No treatment necessary. Work done with live or exhaust steam. 7 lbs. evaporation per pound of steam used. Scale deposits can be entirely removed without stopping operation of the evaporator. No gases left in solution in the water produced, so that it is fit for use without aeration.

—ZAREMBA COMPANY, BUFFALO, N. Y.

**STILLS.** For laboratories. See second part of this Dictionary, devoted to Measuring Instruments and Laboratory Supply.

**STIRRERS.** In melting copper, brass, aluminium, tin, zinc, etc., rods and bars containing graphite have always been used as stirrers. Acheson graphite rods and bars can readily be machined to fit any holder, contain no clay or other bond to contaminate the metal, and, being a pure form of carbon throughout (99%) reduce oxides present in the bath with evident beneficial results.

—INTERNATIONAL ACHESON GRAPHITE CO., NIAGARA FALLS, N. Y.

**STIRRERS.** Of acid-proof stoneware in various sizes for fluids of all consistencies.

—**DIDIER-MARCH Co., NEW YORK.**

**STIRRERS, STONEWARE** supplied in any shape or size; according to the consistency of the material to be handled, the stirrers are either made paddle or screw shaped; and also be furnished of enameled cast iron.

—**J. W. SITTIG, NEW YORK.**

(Other stoneware makers see Stoneware.)

**STIRRING LIQUIDS.** See Agitation.

**STOKERS, MECHANICAL, WESTINGHOUSE.** New model Roney stoker for mechanically firing all commercial fuels, especially low grade. These stokers are adaptable to any type of boiler and enable one fireman to handle from 2000 to 3000 h.p. in boilers.

—**WESTINGHOUSE MACHINE Co., PITTSBURGH, PA.**

**STONEWARE, CHEMICAL.**

—**DIDIER-MARCH Co., NEW YORK.**

—**CHAS. GRAHAM CHEMICAL POTTERY WORKS, BROOKLYN.**

—**J. W. SITTIG, NEW YORK.**

—**A. J. WEEKS, AKRON, OHIO.**

**STONEWARE, CHEMICAL.** Complete line of chemical stoneware. Special acid-proof glazing, a new departure from the old method of salt glaze and much superior in resisting the action of acids.

—**U. S. STONEWARE Co., AKRON, OHIO.**

**STORAGE VESSELS.** For laboratories, made of acid-proof stoneware, with lids and inscription as may be desired for laboratories and drug stores.

—**DIDIER-MARCH Co., NEW YORK.**

**STORAGE VESSELS.** Graham chemical stoneware tanks, cylindrical or square, provide best means for holding acids, alkalies, chlorinated liquids, etc., in any strength. All sizes made up to order, with inlets, outlets, etc., according to customers' requirements. Guaranteed to be chemical proof.

—**CHARLES GRAHAM CHEMICAL POTTERY WORKS, BROOKLYN, N. Y.**

**STORAGE VESSELS.** Of stoneware, in conical or cylindrical form, holding up to 800 gallons.

—**J. W. SITTIG, NEW YORK.**

**STORAGE AND BOILING VESSELS.** With iron mantle, holding up to about 5000 gallons made of stoneware segments, tightly ground together and enclosed in an iron jacket, the space between the stoneware being cast out with cement; practically indestructible.

—**J. W. SITTIG, NEW YORK.**

**STORAGE VESSELS.** Of chemical stoneware made either straight or of conical or oval shape. To be perfect for the use of storing acids they should be made of a proper combination of clay and glazed with the best acid-proof glazing. A heavy projecting rim is required to insure strength to the top of the pot.

—U. S. STONEWARE CO., AKRON, OHIO.

(Other stoneware makers see Stoneware.)

**STOVES.** Hot blast U-pipe stoves for heating blast in pyritic smelting of copper ores.

—COLORADO IRON WORKS CO., DENVER, COLO.

**STRAIGHTENING MACHINES.** For straightening beams, rails, etc.

—MACKINTOSH, HEMPHILL & CO., PITTSBURGH, PA.

**SUBLIMING DISHES.** For iodine, etc., made of acid-proof stoneware, in various shapes and sizes, covers ground on to a tight fit.

—DIDIER-MARCH COMPANY, NEW YORK.

(Other stoneware makers see Stoneware.)

**SUGAR OF LEAD.** Acetate of lead—all grades.

—THE GRASSELLI CHEMICAL CO., CLEVELAND, OHIO, CHICAGO, ILL. AND NEW YORK.

**SUGAR MACHINERY.**

—ALLIS-CHALMERS CO., MILWAUKEE, WIS.

**SULPHATE OF ZINC.** For cold or electro galvanizing. Full information on request.

—THE GRASSELLI CHEMICAL CO., CLEVELAND, OHIO, CHICAGO, ILL. AND NEW YORK.

**SULPHIDE OF IRON.**

—PENNSYLVANIA SALT MFG. CO., PHILADELPHIA, PA.

**SULPHUR.** Used in the chemical industries, in the manufacture of sulphuric acid; it also enters into a multitudinous number of acids of which sulphuric is the base or a component part. Used in the manufacture of sulphurous acid for use in the pulp mills; the manufacture of gun powder and other explosives; is employed as a fumigant; as a fungicide and germicide to plant life; for fertilizer material; as a component part of the material used for ignition purposes in fuses and matches; for bleaching various materials—cotton goods, grain, etc. Sulphur is also one of the chief ingredients in sheep-dip. The refined grades enter largely into the manufacture of different drugs; crude also used in the preparation of colors and the refining of oil. Malt companies also use sulphur in their process, and it is also employed in evaporating apples. As a preservative it is also used by beef packers and others. Glue companies and photographic film concerns also use sulphur in the preparation of

their commodities. In metallurgy, sulphur is employed in certain processes of smelting and precipitating metal; in connection with the production of steel rails of certain specific hardness; also for putting a clean face on steel, and for the embedding of heavy machinery. In the electric industry, sulphur is employed in the manufacture of storage batteries and the preparation of rubber for installation purposes.

—UNION SULPHUR COMPANY, NEW YORK.

**SULPHUR.** Roll brimstone, flour and flowers of sulphur.

—GENERAL CHEMICAL CO., NEW YORK CITY.

**SULPHUR DIOXIDE.** For bleaching, ice plants, sugar refineries, silk mills, etc.

—CENTRAL HUDSON CHEMICAL CO., FISHKILL-ON-HUDSON, N. Y.

**SULPHUR FURNACES.** See Furnaces, Sulphur.

**SULPHURIC ACID APPARATUS.** Fused silica apparatus for the manufacture and concentration of sulphuric acid supplied in various forms. The material is entirely acid-proof, and is quite free from metals. It resists heat and sudden changes of temperature, and accordingly the vessels for concentration can be used in direct contact with the flame. A high efficiency is obtained without rapid destruction of the plant. Descriptive catalog free.

—THE THERMAL SYNDICATE LTD., NEW YORK.

**SULPHURIC CONCENTRATION, KESSLER EVAPORATORS.**

Not stills; an air drying process with resulting economy in concentrating to any strength; high concentration at low temperatures, no loss of acid or contamination of product; no break-downs, fumes, or public nuisance in the strictest foreign cities; practically no repairs. Highest endorsement by English Alkali Inspectors. Used by the largest manufacturers in all principal countries. Awarded the gold medal by the National Society for Development of Arts and Manufacturers. Places the simple, reliable, Chamber System in position to successfully compete with Contact Processes on all strengths up to 99%.

—L'ETABLISSEMENTS KESSLER, CLERMONT-FERRAND, FRANCE,  
(AMERICAN REPRESENTATIVE, W. M. GROSVENOR, NEW YORK).

**SULPHUROUS ACID.** See Sulphur; Cooler, lead; Furnaces, sulphur.

**SWITCHBOARDS, WESTINGHOUSE.** Complete switchboard equipments for iron, steel and general industrial plants.

—WESTINGHOUSE ELECTRIC & MFG. CO., PITTSBURGH, PA.

**SYPHONS.** Of acid-proof stoneware, in various styles and shapes for large and small vessels.

—DIDIER-MARCH COMPANY, NEW YORK.

(Other stoneware makers see Stoneware.)

**SYPHONS, ACID**, of fused silica. See also Quartz, Fused in part II of this Dictionary.

—THE THERMAL SYNDICATE LTD., NEW YORK.

**SYPHONS, ACID, STEAM-JET**. Acid syphons, made of lead, stoneware, porcelain, iron and brass for elevating and transferring acid and other solutions by means of steam. Where steam is objectionable, we refer to "air-jet lifts" and "automatic montejus" operated by compressed air. These acid syphons are made in three separate and distinct constructions, according to material, and therefore space here will not permit detailed description, except to say, that the proportions of steam pressure and height of elevation to which our standard machines are constructed is, steam pressure in pounds = 20, 40, 60, 80, 100. Total elevation in feet = 20, 40, 60, 80, 100. Capacities range from 200 to 30,000 gallons per hour. Manufacturers catalogues AA-2, DD-2, HH-2 and OO-2 give full particulars.

—SCHUTTE & KOERTING CO., PHILADELPHIA, PA.

**TANKS**. See also Kettles.

**TANKS**. Open or closed tanks, receptacles and boilers, etc., made of sheet metal of all kinds best suited for desired service. If desired seams can be welded, thus avoiding rivet heads and hard or soft solder which for some purposes is not desirable. Tanks can be furnished with block-tin or lead lining.

—BAEUEERLE & MORRIS, PHILADELPHIA, PA.

**TANKS** for oil, water, cyaniding solutions, mining solutions, wine acid solutions.

—PACIFIC TANK & PIPE CO., SAN FRANCISCO, CAL., PORTLAND ORE., LOS ANGELES, CAL.

**TANKS**. For solutions. All kinds, wood, cast, iron steel and earthenware. Especially for electroplaters.

—HANSON & VAN WINKLE COMPANY, NEWARK, N. J.

**TANKS**, oil storage. Cylindrical style ready for transportation in capacities of 500 to 15,000 gallons. Manhole and all flanges for pipe connections.

—ROCKWELL FURNACE COMPANY, NEW YORK.

**TANKS**, oil storage. Cylindrical style ready for transportation in capacities of 500 to 15,000 gallons. Manhole and all flanges for pipe connections. Blueprint of setting and Catalog 3.

—W. S. ROCKWELL COMPANY, NEW YORK.

**TANKS**, oil storage.

—MONARCH ENG. & MFG. CO., BALTIMORE, MD.



**TANKS, CEMENT, ACID-PROOF CEMENT.** Concrete or cement tanks of any size or shape are acid-proofed by saturating them with sulphur. Write for licenses.

—ANSON G. BETTS, TROY, N. Y.

**TANKS** for acids, of fused silica.

—THERMAL SYNDICATE LTD., NEW YORK.

(See also Quartz, Fused, in part II of this Dictionary.)

**TANKS, COPPER.** For all chemical and metallurgical purposes.

—F. J. STOKES MACHINE CO., PHILADELPHIA, PA.

**TANKS, ENAMELED STEEL.** Acid and alkali-proof storage tanks. Made of plate steel and coated with an enamel that is absolutely acid and alkali proof. All seams are welded and there are no riveted, bolted, or packed joints. Storage tanks in one piece, from 10 to 1700 gallons capacity.

—THE ENAMELED PIPE & ENGINEERING CO., ELYRIA, OHIO.

**TANKS, RUBBER.** Of hard rubber.

—AMERICAN HARD RUBBER CO., NEW YORK.

**TANKS, STEEL.** Of all kinds used in cyanide work, including lead-lined tanks for acid treatment. Special fittings and attachments for cyanide process.

—COLORADO IRON WORKS CO., DENVER, COLO.

**TANKS, STEEL SEAMLESS, COLD DRAWN.** Specially adapted to retain air, gas, steam, water, oils, fluids, etc., under pressure for lighting systems, fire extinguishers and air brake reservoirs oxygen gas, hydrogen gas, calcium light, gasoline, acetylene gas and chemical tanks, automobile tanks, fuel oil burner tanks, heater tanks, expansion and anti-expansion tanks, filter tanks, gas and gasoline engine tanks, nebulizer, vaporizer and atomizer tanks, and for any purpose, where a light, strong, durable, and well made tank is wanted. Spuds are tapped to suit requirements and can be placed at any point on the tank. Tanks and cylinders are made for any hydraulic pressure test from 150 to 1200 pounds per square inch, the thickness of material in the finished product varying according to the test required. All pieces are thoroughly coated inside and out (tinned or galvanized) to suit requirements. The general requirements call for 300 pounds hydraulic test. In all diameters 6"-7"-8"-9"-10"-12"-14"-16"-18"-20". And in any length up to ten feet.

—JANNBY, STEINMETZ & Co., PHILADELPHIA.

**TANKS, STONEWARE.** Of acid-proof stoneware, of all sizes and capacities, with and without outlets.

—DIDIER-MARCH COMPANY, NEW YORK.

(Other stoneware makers see Stoneware.)

**TANKS, STONEWARE SQUARE.** Of best alkali, acid temperature-resisting material, used for refining and plating purposes, made

up in any sizes as far as their construction in stoneware is practicable; very favorably known throughout the country. Are also made of cast-iron coated with acid-proof enamel.

—J. W. SITTIG, NEW YORK.

**TANKS, WOOD.** Of yellow pine, white pine, cypress and cedar, open at top or closed with head, round, oval or rectangular shapes especially for chemical works.

—G. WOOLFORD WOOD TANK MFG. CO., PHILADELPHIA, PA.

**TEMPERING FURNACES.** See Furnaces, Tempering Steel and Furnaces Electric.

**TESTING OF REFRACTORIES.** We maintain a complete physical and chemical laboratory and testing department and are prepared to make complete tests and analyses of all refractories employed in the construction of metallurgical, electrical and chemical works furnaces. Submit us samples of your slags with full information and particulars governing your furnace conditions and we will make analysis and go into detail from the engineering as well as chemical standpoint.

—LACLEDE-CHRISTY CLAY PRODUCTS CO., ST. LOUIS, MO.

#### **TETRACHLORIDE OF TIN.**

—GOLDSCHMIDT DETINNING CO., NEW YORK CITY.

**THERMIT.** The trade name given to the mixture of iron oxide and finely divided aluminum used in the applications of aluminothermics, which see. When ignited by means of ignition powder in one spot, the reaction between the two ingredients spreads throughout the mass without supply of heat or power from outside. The aluminium combines with the oxygen of the iron oxide to aluminium oxide  $Al_2O_3$ —a slag, which floats on the top and occupies three-fourths of the volume of the superheated liquid mass. During the formation of this aluminium-oxide the iron is set free, and, being the heavier, sinks to the bottom of the containing vessel. Its weight equals that of the slag and is half the weight of the quantity of thermit ignited. Its volume, however, is only one-third of that of the slag. The reaction must take place in suitable vessels, namely, magnesia-lined crucibles. (See "Welding Outfit—Thermit.")

—GOLDSCHMIDT THERMIT CO., NEW YORK.

#### **THERMIT STEEL RESULTING FROM THE THERMIT REACTION.**

Is a pure mild steel of about the following average analysis

Carbon.....	0.05 to 0.10
Manganese.....	0.08 " 0.10
Silicon.....	0.09 " 0.20
Sulphur.....	0.03 " 0.04
Phosphorus.....	0.04 " 0.05
Aluminum.....	0.07 " 0.18

Its weight is half of that of the quantity of thermit ignited in order to produce it. (See "Thermit.")

—GOLDSCHMIDT THERMIT CO., NEW YORK.

**TILE.** Grate tile, locomotive tile. Fire-clay tile, coke-oven tile. Tile for oil-burning furnaces.

—THE ASHLAND FIRE BRICK CO., ASHLAND, KY.

**TIMBER PRESERVING MACHINERY.**

—ALLIS-CHALMERS CO., MILWAUKEE, WIS.

**TIN.** Muriate of tin crystals and muriate of tin solution, bichloride and oxy muriate of tin. Tetrachloride of tin.

—GENERAL CHEMICAL CO., NEW YORK CITY.

**TIN BICHLORIDE.**

—GOLDSCHMIDT DETINNING CO., NEW YORK CITY.

**TIN TETRACHLORIDE.**

—GOLDSCHMIDT DETINNING CO., NEW YORK CITY.

**TIN-LINED** iron pipe. See Pipe.

**TINNING FLUX.**

—THE GRASSELLI CHEMICAL CO., CLEVELAND, OHIO, CHICAGO, ILL. AND NEW YORK.

**TINNING FURNACES.** See Furnaces, Tinning.

**TITANIUM THERMIT.** A material for purifying iron and steel. See Foundry Practice with Thermit.

—GOLDSCHMIDT THERMIT CO., NEW YORK CITY.

**TON-CAP SCREENS.** See Screens, Ton-cap.

**TORCH, OXY-ACETYLENE.** See Welding, Oxy-acetylene and Cutting, Oxy-acetylene.

**TOURILLS.** Receivers, made of acid-proof stoneware with 2 or 3 sockets in various sizes and shapes for the absorption of hydrochloric acid or condensation of nitric acid, etc.

—DIDIER-MARCH COMPANY, NEW YORK.

**TOURILLS, SYSTEM CELLARIUS.** Made of acid-proof stoneware, for cooling and absorption apparatus. These tourills are very efficient owing to the large cooling surface. The absorbing liquid travels twice the length of the tourill. Especially well suited for hydrochloric acid plants. By efficient cooling an acid of 24° Bé can be obtained and the capacity increased.

—DIDIER-MARCH COMPANY, NEW YORK.

**TOURILLS, VACUUM.** Made of acid-proof stoneware in various capacities. These tourills are tested to stand a vacuum of 26 inches.  
—**DIDIER-MARCH COMPANY, NEW YORK.**  
(Other stoneware makers see Stoneware.)

**TOWER FILLINGS.** Scherfenberg patent, for Glover, Gay-Lussac and Reaction Towers, also for cooling, condensing, absorption and washing towers, easily built, large reacting surface and gas passage, with even distribution. Made of acid proof stoneware. Also made of fire brick for metallurgical purposes.  
—**DIDIER-MARCH COMPANY, NEW YORK.**  
(Other stoneware makers see Stoneware.)

**TOWER FILLINGS.** Consisting of partition pipes, plates, cups, balls, etc., all made of acid-proof stoneware, offering large surface for cooling and absorption.  
—**DIDIER-MARCH COMPANY, NEW YORK.**  
(Other stoneware makers see Stoneware.)

**TOWER FILLINGS.** Every description of tower packings, made from best chemical proof stoneware. Rings, tubes, pans, Guttman balls, etc.  
—**CHARLES GRAHAM CHEMICAL POTTERY WORKS, BROOKLYN, N. Y.**

**TOWER FILLINGS.** Acid-proof brick. Vitrified chemical rings for packing acid towers.  
—**LACLEDE-CHRISTY CLAY PRODUCTS CO., ST. LOUIS, MO.**

**TOWER FILLINGS.** Chemical rings and other special tower packing.  
—**A. J. WEEKS, AKRON, OHIO.**

**TOWNSEND CELL.** See Cells, Electrolytic.

**TRAMWAY SYSTEMS,** Overhead trolleys, etc. In foundries and elsewhere for conveying material by means of trolleys and hoists. Switches, curves, etc., installed complete. Electric, hand or pneumatic.  
—**NORTHERN ENGINEERING WORKS, DETROIT, MICH.**

**TRANSFORMERS.** Alternating-current electric.  
—**ALLIS-CHALMERS CO., MILWAUKEE, WIS.**

**TRANSFORMERS, ELECTRIC, WESTINGHOUSE.** High-tension air-blast; oil-insulated, water-cooled; oil-insulated self-cooled. In any capacity for indoor or outdoor service.  
—**WESTINGHOUSE ELECTRIC & MFG. CO., PITTSBURGH, PA.**

**TRANSFORMERS, ELECTRIC, HEAVY-CURRENT, WESTINGHOUSE.** Specially designed for heavy current, oil-insulated water-cooled transformers for electrolytic and furnace work.  
—**WESTINGHOUSE ELECTRIC & MFG. CO., PITTSBURGH, PA.**

**TRANSPORT VESSELS OF STONEWARE.** Also adaptable for storing large quantities of acids, made up to hold about 800 gallons of liquids.

—J. W. SITTIG, NEW YORK.

**TRI-SODIUM PHOSPHATE.** For softening water. Removes scale and prevents incrustations in boilers.

—THE GRASSELLI CHEMICAL CO., CLEVELAND, OHIO, CHICAGO, ILL. AND NEW YORK.

**TUBE MILL.** See Crushing and Grinding.

**TUBING, FUSED SILICA.** See also Quartz, Fused in part II of this Dictionary.

—THERMAL SYNDICATE LTD., NEW YORK.

**TUBING, RUBBER.** We make a specialty of rubber tubing either pure or with cloth insertion, for conducting acids, chemicals, etc., under different pressures. When the use is stated we can supply tubing that will fully answer all requirements.

—BOSTON BELTING COMPANY, BOSTON, MASS.

**TUBING, RUBBER.** Brands Granite Shawmut Harlem. Cloth insertion tubing. For acids, etc.

—REVERE RUBBER CO., BOSTON, MASS.

**TUBING, RUBBER ANTIMONY.** Pure antimony rubber tubing constructed especially for chemically laboratory use, with extra heavy walls. Sizes,  $\frac{3}{16}$ " ;  $\frac{1}{8}$ " ;  $\frac{3}{8}$ " ;  $\frac{1}{2}$ ". Catalog B.

—BUFFALO DENTAL MFG. CO., BUFFALO, N. Y.

**TUNGSTATE OF SODA.**

—PRIMOS CHEMICAL CO., PRIMOS, PA.

**TUNGSTEN.** See also Ferro-tungsten and Scheelite.

**TUNGSTEN.** Metallic, 96 to 99% pure.

—GEO. G. BLACKWELL, SONS & CO., LTD., LIVERPOOL, ENGLAND.

**TUNGSTEN.** Metallic, low carbon.

—PRIMOS CHEMICAL CO., PRIMOS, PA.

**TUNGSTEN.** Powder 98% pure. (Low in carbon.)

—ROESSLER & HASSLACHER CHEMICAL CO., NEW YORK.

**TUNGSTEN.** In powder metal. 99%, free from carbon. "Ruth-lock" brand.

—MARCUS RUTHENBURG, LONDON.

**TUNGSTIC ACID.**

—PRIMOS CHEMICAL CO., PRIMOS, PA.

**TURBINES, HYDRAULIC.** Reaction and impulse turbines. Any type, any capacity, any head. Built to special design to meet any and all conditions.

—ALLIS-CHALMERS CO., MILWAUKEE, WIS.

**TURBINES, STEAM.** The Allis-Chalmers Co's. steam turbine is of the horizontal, multiple-expansion, parallel full annular flow "reaction" type, generally known as the Parsons type. Contains many important improvements made by the Allis-Chalmers Co. A full line of steam turbines and turbogenerators, ranging in capacity from 300 to 20,000 kw., for alternating-current service. Economical, reliable, efficient. Used in many different industries.

—ALLIS-CHALMERS CO., MILWAUKEE, WIS.

**TURBINES, STEAM—WESTINGHOUSE.** The steam turbine consists of a casing containing a number of rows of stationary blades which direct the expanding steam against similar sets of blades on a cylindrical element rotating within the casing. Westinghouse turbines are reaction type, or reaction with impulse blading, or impulse only for small sizes. Depending on the service, they are used with or without vacuum. Turbines are built in any required size from 300 kw. to 10,000 kw. and upwards, and from 3600 to 750 r.p.m. Machines below 300 kw. are generally of the impulse type. Large overload capacities are a feature of Westinghouse turbines.

—WESTINGHOUSE MACHINE CO., PITTSBURGH, PA.

**TURBINES, STEAM. HIGH-PRESSURE—WESTINGHOUSE.** Designed for non-condensing operation, and eminently suited for service in central stations operating district-heating systems, owing to their great overload capacity and flat water rate curve. A back pressure of from 1 to 6 lbs. is all that need be carried for satisfactory service; or a vacuum return system having no return pressure on the engines, may be employed.

An alternative to straight non-condensing, is furnished by the bleeder system, in which the steam for heating is taken from the second barrel of a condensing turbine (equivalent to running non-condensing) and all the steam not required for heating, condensed after passing through the low pressure section of the turbine. This system insures maximum economy under all conditions, as there is no waste of steam, it either being sold for heat or used in the low pressure system for generating power.

—WESTINGHOUSE MACHINE CO., PITTSBURGH, PA.

**TURBINES, STEAM. LOW-PRESSURE—WESTINGHOUSE.** The term low-pressure turbine refers to turbines which use exhaust steam at about atmospheric pressure, by expanding it to lower pressure maintained by means of a condenser. Steam at atmospheric pressure is available for use in turbines in nearly all steel mills, and in many light and railway plants originally designed to operate noncondensing. As the low-pressure turbine utilizes exhaust steam, the power generated is practically without cost. It does not increase

steam consumption of the main engine and therefore does not require the expenditure of more fuel although capable of developing from 80% to 100% of the power obtained from the high pressure reciprocating engine.

—WESTINGHOUSE MACHINE CO., PITTSBURGH, PA.

**TUYERE COCKS. ATWOOD.** Cast brass. For use on blast furnaces.

—PITTSBURGH VALVE, FOUNDRY & CONSTRUCTION CO., PITTSBURGH, PA.

**UNIVERSAL KNEADING AND MIXING MACHINE.** See Mixers and Kneaders.

**UNIVERSAL PAPER PULPING MACHINE.** See Paper Pulping.

**VACUUM.** See Exhausters, and Compressors.

**VACUUM APPARATUS.** For boiling and distilling, made of acid-proof stoneware, either in one piece or two pieces, in various capacities and shapes.

—DINIER-MARCH COMPANY, NEW YORK.

(Other stoneware makers see Stoneware.)

**VACUUM DRYERS.** See Dryers.

**VACUUM EVAPORATORS.** See Evaporators and Pans.

**VACUUM EXHAUSTER.** See Blowers Piqua Positive.

**VACUUM PANS.** See Pans and Evaporators.

**VACUUM VESSELS OF STONWARE.** Capable of withstanding as much as 730-740 mm. of mercury.

—J. W. SITTIG, NEW YORK.

**VALVES. ATWOOD.** Gate valves, inside or outside screw, hand, motor or cylinder operated. Regularly built in all sizes up to 72".

Low pressure:—Parallel seats, iron body bronze mounted sizes 8" to 72" for working pressures up to 50 lbs. Used largely for pump suction or discharge, low pressure air, condenser and exhaust lines, gas lines, etc.

Standard pressure:—Steam and water valves for working pressures up to 125 lbs. per sq. in. steam.

Medium pressure:—For 175 lbs. steam.

High pressure steam valves for working pressure up to 250 lbs. are semi-steel, solid bronze seats, packing collars and arch nuts and cold rolled steel stems. For pressures higher than 250 lbs. see below Valves, Hydraulic.

Globe and angle valves. Automatic exhaust relief valves for

condenser plants to protect the system from undue pressure in case of loss of vacuum. Low-pressure butterfly valves. Transfer valves, etc.

—PITTSBURGH VALVE, FOUNDRY & CONSTRUCTION CO., PITTSBURGH, PA.

**VALVES, HYDRAULIC, ATWOOD AND FITTINGS.** Two standard pressures, 500 lbs. and 1000 lbs. Gate and wedge valves, critchlow valves and nests. Hydraulic manifolds for iron and steel works, Tanner operating valve, hydraulic spring cushions, etc.

The Tanner operating valve, 3-way or 4-way, has been designed to control the admission and exhaust of water under pressure as it is used in the cylinders of hydraulic machinery. Very effective for use with hydraulic manifolds operating steel-works apparatus, such as blast-furnace bells, etc. Cup packings, the best type for ordinary water, are used. For large sizes the valve is controlled by small pilot valve which operates an actuating cylinder on the main valve and which may be placed at any distance from the main valve. Regular pressure 1000 lbs. These valves are built especially for higher pressures.

—PITTSBURGH VALVE, FOUNDRY & CONSTRUCTION CO., PITTSBURGH, PA.

**VALVE, GAS REVERSING, AMSLER,** for furnaces and similar purposes. A device for saving the gas usually wasted at the time of reversal. The valve reverses the gas and air simultaneously, and comprises both gas and air valve. The gas is automatically cut off during the time of reversing, and at the same time the residual gas in the flues and in the chambers is taken into the furnace and burned instead of being wasted by going up the chimney as heretofore.

—WALTER O. AMSLER, PITTSBURGH, PA.

**VALVE. LEAD-LINED,** iron valve, in form of a Y. The washer can be hard lead, asbestos or rubber. The valve can be made either flanged or screwed. All the interior parts are thoroughly protected with lead. The washer can be removed at any time, and a new one substituted at a very slight expense. They are all made outside screw and yoke, and the lead lining extends up into the stuffing box. There is no possible chance for acids or corrosive liquors to get at the iron.

—LEAD-LINED IRON PIPE CO., WAKEFIELD, MASS.

**VALVE, LEAD-LINED CHECK VALVE.** The Schutte Lead Lined Check Valve, as its name implies, is a check to be used in lead pipe lines for handling acids. Every inside part is completely lined with hard lead. The disc is an earthenware ball which closes against a reinforced seat turned in the hard lead. This ball is guided by ribs in body. The valve is flanged body; the inlet being offset and above the outlet. The lead projects over face of flanges and turned for smooth joint. Catalog LL-8.

—SCHUTTE & KOERTING CO., PHILADELPHIA, PA.



**VALVE, LEAD LINED STOP VALVE.** Made for handling acids, etc.; has a brass casing lined with hard lead on every inside part which comes in contact with the liquid. It is made in the angle form for convenience of moulding. The lead seat is cone faced and reinforced at this point in body, while the lead disc is strengthened by a flattened knob on bottom of hard bronze stem. The lead surrounds this stem entirely to outside of lead lined stuffing box. The spindle is prevented from turning by a crosshead guided in yoke, while the nut and hand wheel only revolves. The valve is flanged, the lead projecting over faces and turned for smooth joint. This valve makes a positive shut-off and has wearing and lasting qualities. Catalog LL-8.

—SCHUTTE & KOERTING CO., PHILADELPHIA, PA.

**VALVES, RUBBER.** We supply all shapes and sizes of rubber valves for all temperatures and pressures, and for use in connection with air, acids, alkalies, water, chemicals, oil, etc.

—BOSTON BELTING COMPANY, BOSTON, MASS.

**VALVES, RUBBER.** For mining and blower engines, acid, ammonia, boiler feed and other pumps. Valves to meet the requirements of each case. Among our specialties are valves for the beet sugar industry, mine pumps (for all conditions of water), marine pumps, Bessemer blowing engines, boiler feed pumps (high temperatures), pumps of water works, etc.

—REVERE RUBBER CO., BOSTON, MASS.

**VALVES, STONEWARE.** Check valves for pipe lines under pressure; foot valves for pumps; an acid proof stoneware ball accurately ground on to a stoneware seat.

—DIDIER-MARCH CO., NEW YORK.

(Other stoneware makers see Stoneware.)

**VALVES, STONEWARE, SAFETY.** Of acid-proof stoneware, for Montejus or Autoclaves.

—DIDIER-MARCH COMPANY, NEW YORK.

(Other stoneware makers see Stoneware.)

#### **VANADIUM.**

—AMERICAN VANADIUM CO., PITTSBURGH, PA.

#### **VANADIUM ALLOYS.**

—AMERICAN VANADIUM CO., PITTSBURGH, PA.

**VANADIUM CAST IRON.** For gas and steam engine cylinders, ammonia castings, chemical and caustic castings. Strong, tough, close grain, readily machined.

—AMERICAN VANADIUM CO., PITTSBURGH, PA.

#### **VANADIUM-COPPER.** For brass foundries.

—C. W. LEAVITT & CO., NEW YORK.

**VANADIUM STEELS.** Anti-fatigue. Strongest and toughest statically and dynamically. Type "A": for axles, crank shafts, transmission parts, connecting rods, piston rods, crank pins, gears, shafting bolts, etc. Type "D": For springs, pinions, gears, keys, wire cable, shafting, gun forgings, rifle barrels, etc. Type "E" Case hardening steel for machine and engine parts, clash gears, rivets, bolts, etc. Type "G": For tires and solid steel car wheels; Type "H": For cutlery, tool steel, dies, balls and ball races, rock drills, files, saws, etc. Type "J": Steel castings, crucible and open hearth for all purposes. Type "K": For dies, rivet sets, etc.  
—AMERICAN VANADIUM CO., PITTSBURGH, PA.

**VAPOR CONDENSER.** See also "Dust Collector," "Gas Washer," "Smoke Consumer."

**VAPOR CONDENSERS.** The Koerting "obnoxious vapor condenser" absorbs fumes and bad-smelling vapors in water. The vapor condenser proper, operated by water pressure, sucks in the vapors and gases from dryer, etc., and partly absorbs them, and then discharges into tank where they receive a further treatment of water by means of Koerting centrifugal spray nozzles, arranged in this tank. The draft created by the vapor condenser proper forces the unabsorbed vapors and gases up a stack, where they are finally absorbed by several sprays of water from Koerting spray nozzles, and the water drains back to tank and discharges at bottom to sewer. In cases where the vapor contains gases which are objectionable and cannot be absorbed by water, we install an arrangement in connection with our Koerting vapor condenser whereby certain chemicals are sprayed through spray nozzle installed in up-take or stack. Catalog RR-4.

—SCHUTTE & KOERTING CO., PHILADELPHIA, PA.

**VENTILATORS.** Lead, steam-jet. See Blowers, lead, steam-jet.  
—SCHUTTE & KOERTING, PHILADELPHIA, PA.

**VENTILATOR FANS.** For all purposes.  
—ALLIS-CHALMERS CO., MILWAUKEE, WIS.

**VITREOSIL, ACID-PROOF CHEMICAL APPARATUS.** Made of pure fused silica. Entirely resists acids and heat. Supplied in various forms of pipes, retorts, etc.

(See also Quarz, Fused in Part II of this Dictionary).

—THE THERMAL SYNDICATE LTD., NEW YORK.

**WASHER.** Scaife patent automatic trough washer, for ores, coal, sand, etc. This apparatus is designed to wash the impurities and foreign matter from ores and coal, also metallic sweepings, etc. The trough is a semi-cylinder of cast iron slightly elevated at one end, and in this revolves a cast-iron spiral ribbon conveyor which forms a series of dams or riffles which catch the heavier material and discharge it continuously at the upper end of the trough. The lighter

materials are carried by the water to the discharge outlet at the lower end. The trough is two feet in diameter by twenty-four long and is rocked transversely while the conveyor is revolved. Washer possesses efficiency, simplicity, durability, large scope and capacity, low first cost and small cost of maintenance and operation. Booklet.

—SCAIFE FOUNDRY AND MACHINE CO., LTD., PITTSBURGH, PA.

**WASHERS.** Washers, bushings, discs, and other small carbon articles formerly made in moulds, can frequently be far more economically produced by machining from solid Acheson graphite rods. High electrical conductivity, purity (99%), smoothness, lubricating properties, resistance to oxidation and disintegration, and non-arcing properties are important considerations in this connection.

—INTERNATIONAL ACHESON GRAPHITE CO., NIAGARA FALLS, N. Y.

**WASTE PRODUCTS.** Many manufacturers are throwing away as refuse, materials that can be made to yield more or less revenue. From the nature of the business of this firm as manufacturers of evaporators and chemical machinery, it is in position to act, and has frequently acted, as a clearing house for information and advice on the subject of waste products. To the extent of its knowledge it will be pleased to assist in the development of propositions of this kind.

—ZAREMBA COMPANY, BUFFALO, N. Y.

**WATER PIPE AND TANKS.** See Pipe and see Tanks.

**WELDING—OXY-ACETYLENE.** Oxy-acetylene welding apparatus, designed by experts having extensive foreign experience, to meet every welding requirement. A feature of this apparatus is its portability. As acetylene cylinders are used, no difficulty from an insurance standpoint is experienced, and there is no necessity of building expensive generator houses. The blow pipes are economical and will not flash back or overheat. The reducing valves are of types that have been used for a long time in other lines, but have been modified to meet the special requirements of oxy-acetylene welding. The company is also prepared to supply oxygen and acetylene generators but make a special feature of their portable plants.

—AMERICAN OXYGEN CO., PHILADELPHIA, PA.

**WELDING OXY-ACETYLENE.** Cast iron, steel, aluminium, brass, copper and other metals, also welding cast iron to steel, brass and copper to either and to each other. Davis-Bournonville process. A temperature of 6300° F. is attained, under absolute control of the operator. With the Davis-Bournonville torch the acetylene and oxygen gases are most thoroughly mixed, which results in uniform welds, the metals operated upon being neither oxidized nor carbonized. In the tip the oxygen enters directly in line, the acetylene enters laterally through four holes, both uniting and dis-

charging through one hole. The openings are accurately sized to secure proper mixture at a definite relation between the pressures of the two gases. Both gases are furnished to the flame under pressure, which means uniformity in flow. The Davis pressure generator maintains a maximum pressure of 15 lbs. per sq. inch of acetylene gas. The process permits strengthening of worn parts of metal (see Putting-on Tool.) With this process it is possible to build up teeth in broken gear wheels, fill blow holes in castings, weld broken frames, repair steam and water pipes in place, weld aluminium automobile gear cases, automobile crank shafts, etc.

—DAVIS-BOURNONVILLE CO., NEW YORK.

**WELDING, OXY-ACETYLENE.** Oxygenite process (see Oxygenite). "The Weld that held." Easy, effective, economical.

—INDUSTRIAL OXYGEN CO., NEW YORK.

**WELDING, OXY-ACETYLENE. PUTTING-ON TOOL.** With the oxy-acetylene welding torch (see Welding, Oxy-acetylene) metal can be added to worn parts of castings. Weak places can be strengthened. Shafting etc., cut too short, can be lengthened. Small parts missing or broken off, can be added. Patterns sometimes shaped.

—DAVIS-BOURNONVILLE CO., NEW YORK.

**WELDING, OXY-HYDROGEN.** No. 28 oxy-hydrogen burner for lead burning is made of brass throughout. Provided with safety gauzes to prevent striking back of flame. Has six jet tips with varying sized orifices and a wind shield to prevent blowing out of flame when in use out of doors.

—BUFFALO DENTAL MFG. CO., BUFFALO, N. Y.

**WELDING—THERMIT.** (1) The fracture is opened out by drilling a line of holes through the section of the metal to be repaired. A matrix of wax is then formed over the break, of the exact shape that the thermit steel collar which is fused into the casting is to take later. Over this wax matrix is made a mold of refractory material, in a sheet iron box, a preheating gate, pouring gate, and large riser being provided. When the mold is made, a gasoline torch, under compressed air pressure of some 30 lbs., is directed through the preheating hole. It melts out the wax, dries out the mold and brings the metal at the break to a bright red heat. While the preheating is going on, a crucible containing the necessary charge of thermit with the admixture of punchings and manganese, is suspended over the gate. When the necessary temperature is reached, the gasoline torch is withdrawn, the preheating hole plugged with a sand core held in readiness and the charge in the crucible ignited without loss of time. The ignition of the thermit starts the reaction between the aluminium particles and the iron oxide and the superheated liquid steel produced thereby is run into the mold by tapping the crucible from the bottom. The superheated liquid steel running into the mold melts the ends of the casting and fuses with them, and in cool-

ing forms one homogeneous mass. The metal not only fuses together the two ends of the fracture but forms a steel collar which is absolutely amalgamated with the casting and strongly reinforces it. (2) Another method applicable to the welding of pipes and rods is the following: The pieces to be welded are accurately butted together and held in specially constructed clamps. They are not preheated. A cast iron mold is placed around the joint to be welded. The thermit is ignited in a flat-bottom crucible, in which, after completed reaction, the slag floats on top and the superheated liquid steel at the bottom. This superheated mass is poured rapidly over the lip of the crucible, so that the slag will flow first into the mold and form a thin, but highly refractory layer on the walls of the cast iron mold and on the surface of the pieces to be joined. The thermit steel which follows simply lies between two layers of slag. This mass, held in the mold, brings the ends of the pipes or rods to welding temperature. The clamps are then further tightened and the weld is complete.

—GOLDSCHMIDT THERMIT Co., NEW YORK.

**WELDING—THERMIT OUTFIT.** (A) This consists of a crucible supplied in ten different sizes, with a capacity of from 4 to 400 lbs. and a shipping weight of from 40 to 720 lbs., made of sheet iron and lined with magnesia tar. The crucible is supported in a wrought-iron ring, to which are attached three wrought-iron legs. Larger sized crucibles are usually slung in chains. To close the orifice at the bottom, so-called "plugging material" is provided, including a pin, which, when driven up from below, releases the charge in the crucible. To preheat the casting and dry out the mold, a gasoline preheater, operated with compressed air is necessary. With about 20 to 30 lbs. pressure, this gasoline preheater is capable of bringing the heaviest sections, like 8 x 10, to a bright red heat in three or four hours. For tapping-spade, a piece of gas pipe, flattened out at the end, can be used. These appliances form the entire equipment. The superheated liquid steel, which, by fusion, makes the weld, is produced through the ignition of the Thermit Powder, which is shipped in 50 or 100 lb. drums. In order to start the reaction, Ignition Powder is required, the usual proportion being about 1 lb. of Ignition Powder to about 50 reactions. Admixtures which are advisable in operating the process are metallic Manganese and steel punchings.

(B) The pipe welding outfit consists of a cast-iron mold, flat-bottom crucibles of four different sizes, tongs to hold the crucibles, clamps to draw the pipe ends together (which may be loaned by the Goldschmidt Thermit Co., if desired) and the necessary welding portions, accurately measured off for any size and weight of pipe up to 4".

—GOLDSCHMIDT THERMIT Co., NEW YORK.

**WELDING, PIPE, BY THERMIT PROCESS.** A means of making a pipe joint as strong as the pipe itself, without increase of diameter inside or outside of the pipe, with the enormous advantage of the work being done after the pipe is in place; that is to say, in the ditch

or on the roof of a factory, or wherever it may be necessary to do such work. Especially valuable for ammonia service lines. For description of the process see "Welding-Thermit." For necessary outfit see "Welding—Thermit Outfit."

—GOLDSCHMIDT THERMIT CO., NEW YORK.

**WELDING, RAIL JOINTS, THERMIT.** Rail joints made by the thermic process have the special advantage that through the lightness and portability of the outfit, a small number of joints can as economically be welded at one time as a large. The outfit (see "Welding—Thermit Outfit"), sufficient to pour one or two joints, can be transported on a hand truck. The joint is made by surrounding the rail ends with a refractory mold and igniting the thermit in a crucible placed over the gate of the mold. At the end of the reaction of the thermit, the crucible is tapped from the bottom and superheated liquid steel runs into the mold, surrounds the base and web of the rail, with which it fuses on account of its very high temperature, and in cooling makes one solid steel shoe, about 3" wide and about  $\frac{3}{4}$ " thick at the thickest part. This weld combines increased electric conductivity with all the advantages of a continuous rail. An alternative method can be employed, by which not only the web and base of the rail, but also the head are welded. For particulars see special pamphlets of instructions.

—GOLDSCHMIDT THERMIT CO., NEW YORK.

**WELDING SOLID IRON & STEEL SECTIONS BY THE THERMIT PROCESS.** The Thermit Process is the only one which under all circumstances can take its equipment to the job. It can weld sternposts of vessels in drydock, rails in paved streets, locomotives on the engine, without dismantling; crank shafts of any diameter; broken bosses of rolls; arms of the largest dredge buckets, in the field; gear wheels. We also undertake work by contract, under guarantee. For description of operation see "Welding—Thermit."

—GOLDSCHMIDT THERMIT CO., NEW YORK.

#### **WINDLASSES.**

—SCAIFE FOUNDRY AND MACHINE CO., LTD., PITTSBURGH, PA.

**WIRE.** All base metals and alloys in flat and round wire, bare or insulated.

—DRIVER-HARRIS WIRE COMPANY, HARRISON, N. J.

**WIRE, "ADVANCE"** ribbon and sheet. A non-corrosive copper-nickel alloy, containing no zinc. It is uniform in its composition and constant in its resistance under all conditions of service. Specific resistance 48.5 microhms per centimeter cube; temperature coefficient nil. It is especially recommended for measuring instruments standards, shunts, and apparatus in which the wire is subjected to repeated heating and cooling.

—DRIVER-HARRIS WIRE COMPANY, HARRISON, N. J.

**WIRE, "CLIMAX"** and ribbon. Specific resistance 87 microhms per centimeter cube; temperature coefficient +0.00072 per degree C. Its low temperature coefficient fits it for any use to which German Silver can be applied, and its high specific resistance makes it an economical substitute. Its mechanical properties make it available for rheostat work where German Silver is useless on account of its becoming brittle by repeated heating and cooling.

—DRIVER-HARRIS WIRE COMPANY, HARRISON, N. J.

**WIRE, FERRO-NICKEL**, and ferro-nickel ribbon. Specific resistance 28 microhms per centimeter cube; temperature coefficient 0.002 per degree C.

—DRIVER-HARRIS WIRE COMPANY, HARRISON, N. J.

**WIRE, GERMAN SILVER** and ribbon; containing varying percentages of nickel.

—DRIVER-HARRIS WIRE COMPANY, HARRISON, N. J.

**WIRE, MANGANIN**, ribbon and sheet. Specific resistance 42 microhms per centimeter cube; temperature coefficient 0.000018 per degree C.

—DRIVER-HARRIS WIRE COMPANY, HARRISON, N. J.

**WIRE, "MONEL" METAL** and ribbon. Specific resistance 43 microhms per centimeter cube; temperature coefficient 0.002 per degree C.

—DRIVER-HARRIS WIRE COMPANY, HARRISON, N. J.

**WIRE, "NICHROME"** and ribbon. Specific resistance 100 microhms per centimeter cube. May be worked continuously at a temperature of 1000° C. This alloy is practically non-corrosive, has an extremely high melting point about 1500° C, and is far superior to nickel in its ability to withstand high temperatures. Temperature coefficient +0.00044 per degree C. Recommended for laboratory furnaces, electrically heated appliances and resistance elements generally where extreme conditions are to be met.

—DRIVER-HARRIS WIRE COMPANY, HARRISON, N. J.

**WIRE, NICKEL**. Ribbon and sheet. Commercially pure. Specific resistance 11 microhms per centimeter cube; temperature coefficient 0.004 per degree C.

—DRIVER-HARRIS WIRE COMPANY, HARRISON, N. J.

**WIRE CLOTH**. The Tyler "double crimped" wire cloth. Made from 4" space to 200 mesh in all sizes of wire and from iron, steel, brass, copper or phosphor bronze. Catalogue 30.

—THE W. S. TYLER COMPANY, CLEVELAND, OHIO.

**WOOD-PIPE**. See Pipe.

**WOOD DISTILLATION**. See Distillation, Wood.

**WOOD TANKS.**    See also Tanks.

—G. WOOLFORD WOOD TANK MFG. CO., PHILADELPHIA, PA.

**ZINC.**    Zinc chloride solution and fused chloride of zinc.

—GENERAL CHEMICAL CO., NEW YORK CITY.

**ZINC.**    High-grade spelter. Soldering flux, commercial salts, and chloride of zinc in fused, granulated and liquid form.

—SANDOVAL ZINC CO., EAST ST. LOUIS, ILL.

**ZINC AND ZINC DUST.**

—FUERST BROS. & CO., NEW YORK.

**ZINC CHLORIDE.**

—PENNSYLVANIA SALT MFG. CO., PHILADELPHIA, PA.

**ZINC CONCENTRATES.**    40% to 50% Zinc.

—THE WESTERN CHEMICAL MFG. CO., DENVER, COLO.

**ZINC PLATING ON IRON.**    See Electro galvanizing.



## PART II.

# Measuring Instruments and Laboratory Supplies.

---

**ACIDS.** Chemically pure. Hydrochloric, nitric, sulphuric acids. Full particulars and prices on request.

—THE BAKER & ADAMSON CHEMICAL CO., EASTON, PA.

**ACIDS.** "Baker's Analyzed Chemicals." Every label shows an analysis and the guarantee provides that the contents of each bottle will conform with that analysis.

—J. T. BAKER CHEMICAL CO., PHILLIPSBURG, N. J.

**ACIDS.** Chemically pure. Hydrochloric, nitric, sulphuric acids.

—GENERAL CHEMICAL CO. OF PENNA., PITTSBURGH, PA.

—GENERAL CHEMICAL CO., NEW YORK.

**ACIDS.** Chemically pure, sulphuric, hydrochloric, nitric, and aqua ammonia.

—THE GRASSELLI CHEMICAL CO., CLEVELAND, OHIO, CHICAGO, ILL. AND NEW YORK.

**ACIDS,** Chemically pure. The strictly chemically pure sulphuric nitric, and hydrochloric acids (Black Labels) are guaranteed perfect.

—THE WESTERN CHEMICAL MFG. CO., DENVER, COLO.

**AMMETERS, WESTON STANDARD.** See Instruments, Weston Standard.

—WESTON ELECTRICAL INSTRUMENT CO., WAVERLY PARK, NEWARK, N. J.

**AMMONIA,** Aqua, anhydrous and chemically pure. The anhydrous ammonia is sold under a strict guarantee for absolute purity and dryness. The "black label" ammonia (strictly chemically pure) is in the same class as the "black label" acids.

—THE WESTERN CHEMICAL MFG. CO., DENVER, COLO.

**ANALYTICAL APPARATUS.** (See also Balances, Weights.)

—WM. AINSWORTH & SONS, DENVER, COLO.

—WM. GAERTNER & CO., CHICAGO, ILL.

**ANALYTICAL APPARATUS.** Comprising a full line of laboratory supplies for the analysis of fuels, gaseous and solid foods, oils, steel and iron, milk, etc., etc. Also chemicals.

—EIMER AND AMEND, NEW YORK.

**ANALYTICAL APPARATUS AND CHEMICALS.**

—THE BAKER & ADAMSON CHEMICAL CO., EASTON, PA.

—J. T. BAKER CHEMICAL CO., PHILLIPSBURG, N. J.

—J. & H. BERGE, NEW YORK.

—BUFFALO DENTAL MFG. CO., BUFFALO, N. Y.

—THE EMIL GREINER CO., NEW YORK.

—HENRY HEIL CHEMICAL CO., ST. LOUIS, MO.

—HOSKINS MFG. CO., DETROIT, MICH.

—INTERNATIONAL INSTRUMENT CO., CAMBRIDGE, MASS.

—MERCK & CO., NEW YORK.

—QUEEN & CO., PHILADELPHIA, PA.

—E. H. SARGENT & CO., CHICAGO, ILL.

—SCIENTIFIC MATERIALS CO., PITTSBURGH, PA.

—ARTHUR H. THOMAS CO., PHILADELPHIA, PA.

—VOLAND & SONS, NEW ROCHELLE, N. Y.

**ANEMOMETERS.** For measuring the velocity of air or gases, all kinds.

—SCIENTIFIC MATERIALS CO., PITTSBURGH, PA.

**ANEMOMETERS.** Covering a variety of readings from 1000 ft. up to 10,000,000 ft. Also supplied with zero setting attachment so that the hand can be easily and readily set back to zero, with each reading as actual.

—TAYLOR INSTRUMENT COMPANIES, ROCHESTER, N. Y.

**APPARATUS, Special,** for scientific research covering all branches of physics.

—WM. GAERTNER & CO., CHICAGO, ILL.

**ASPHALT TESTING APPARATUS.** A complete line of penetrometers, flow plates, sieves, etc. Somner apparatus for determining specific gravity of asphalt, etc. All the appliances mentioned in "The Modern Asphalt Pavement" by Richardson, and other standard works.

—EIMER & AMEND, NEW YORK CITY.

**ASSAY APPARATUS.** See also Balances, Weights.

—WM. AINSWORTH & SONS, DENVER, COLO.

**ASSAY & Metallurgical Laboratory Supplies.** A complete stock, of balances, crushers, grinders, furnaces, muffles, crucibles, sieves, etc. Heavy chemicals, litharge, acids, soda, mercury, etc., for assaying.

—EIMER & AMEND, NEW YORK CITY.

**ASSAY BALANCES.**

- THE SALT LAKE HARDWARE CO., SALT LAKE CITY, UTAH.  
(See also Balances.)

**ASSAY FURNACES.** See Furnaces, Assay.

**ASSAYERS SUPPLIES.**

- BAUSCH & LOMB OPTICAL CO., ROCHESTER, N. Y.  
—THE SALT LAKE HARDWARE CO., SALT LAKE CITY, UTAH.  
(See also Laboratory Supplies.)

**BACTERIOLOGICAL APPARATUS.** A full line of incubators, sterilizers for heating by gas or electricity, blood counting and culture apparatus.

- EIMER & AMEND, NEW YORK.

**BACTERIOLOGICAL APPARATUS.** See our full illustrated catalogs.

- SCIENTIFIC MATERIALS CO., PITTSBURGH, PA.

**BACTERIOLOGICAL APPARATUS.**

- BAUSCH & LOMB OPTICAL CO., ROCHESTER, N. Y.  
—THE EMIL GREINER CO., NEW YORK.  
—E. H. SARGENT & CO., CHICAGO, ILL.

**BALANCES,** Precision Assay, Analytical and Chemical. The recognized standard. Used by the leading assayers, chemists, chemical and steel works, smelters and mills throughout the world. Annual output 1000 fine balances, Catalog A-4.

- WM. AINSWORTH & SONS, DENVER, COLO.

**BALANCES AND WEIGHTS.** Of all makes and description.

- BAUSCH & LOMB OPTICAL CO., ROCHESTER, N. Y.

**BALANCES AND WEIGHTS.** Analytical and assay balances for rapid and accurate work. Best American Makes.

- J. & H. BERGE, NEW YORK CITY.

**BALANCES AND WEIGHTS.** The analytical and assay balances of our own make have been entirely satisfactory to hundreds of buyers for some ten years past; while fully satisfactory, they are comparatively inexpensive. We also furnish balances of other makes like Becker's, Troemner's, Satorius', G. Kern and Sohn and others. Precision and ordinary balances for general laboratory work. 25 full pages in our Chemical Apparatus Catalog descriptive of our balances and weights, 85 different balances being listed there. The Williams improved Westphal balance for the rapid and accurate determination of the specific gravity of liquids and solids both soluble and insoluble in water, specially suitable for cement laboratories and for the mineralogist and prospector.

- EIMER & AMEND, NEW YORK.

**BALANCES.** Laboratory balances for specific gravity work. Students' balances for high schools, also for commercial purposes. Agents for Sauter's balances and weights, which have been sold for the last twenty-years and have come up to the highest expectations.  
—WM. GAERTNER & CO., CHICAGO, ILL.

**BALANCES and weights.** We are the American agents for the balances made by H. L. Becker Fils & Co., Brussels. They are of superior workmanship, elegant finish, and greatest sensitiveness and accuracy. Our gold-plated analytical balance with aluminium short beam No. 300 has a capacity of 200 grams and is sensitive to 1/20 milligram. Gold-plated weights.  
—HENRY HEIL CHEMICAL CO., ST. LOUIS, MO.

**BALANCES AND WEIGHTS.** Analytical and assay for all purposes. All standard American makes, as well as the better grade of German balances and weights for ordinary weighing as well as most accurate laboratory work.  
—QUEEN & CO., INC., PHILADELPHIA, PA.

**BALANCES.** The Keller balance. Catalog E.  
—THE SALT LAKE HARDWARE CO., SALT LAKE CITY, UTAH.

**BALANCES and weights.** We are the sole U. S. agents for Becker's Sons (Rotterdam) high-grade balances and weights. We are also prepared to furnish balances and weights of any make, such as Troemner's, Ainsworth's, Thompson's, Christian Becker's, Satorius', Kern's, etc. All kinds for all purposes. Illustrated catalogs.  
—E. H. SARGENT & CO., CHICAGO, ILL.

**BALANCES and weights.** Analytical and assay. All kinds. This firm's own balances with special improvements. Also balances of any other make, domestic or foreign.  
—SCIENTIFIC MATERIALS CO., PITTSBURGH, PA.

**BALANCES,** analytical and weights. Sole U. S. Agents for the Standinger analytical and assay balances, also Troemner, Becker, and other American makes at factory prices.  
—ARTHUR H. THOMAS CO., PHILADELPHIA, PA.

**BALANCES AND WEIGHTS.** Standard precision balances and weights. Established 1888. Our new factory is equipped in the most modern way for the manufacture of the finest, most sensitive and quick-weighing balances. We are able to fill almost any telegraphic order in the quickest possible time. Assay balances, analytical balances, bullion balances, balances for scientific use, diamond balances, jewelers' balances, prescription balances, pulp balances. Weights and riders. Repairing of balances and weights promptly attended to. Illustrated catalog E.  
—VOLAND & SONS, NEW ROCHELLE, N. Y.

**BAROMETERS.** Every type of barometer, both mercurial and aneroid.

—TAYLOR INSTRUMENT COMPANIES, ROCHESTER, N. Y.

**BLOWERS.** Foot blowers. Power blowers. Combines air blower and vacuum pump. Our power blowers range in capacity from 4 cu. ft. to 400 cu. ft. per minute, with a pressure of from 1 to 10 pounds per square inch. Excellent for agitating solutions, also for the blending of liquors by the percolation process.

—BUFFALO DENTAL MFG. CO., BUFFALO, N. Y.

**BLOWERS.** Positive pressure blowers of various types. Also hand and foot blowers, etc.

—EIMER & AMEND, NEW YORK CITY.

**BLOWERS.** Belt or electric power rotary positive blowers for supplying 3 to 300 cu. ft. per minute, up to 8 pounds pressure for furnaces, agitating cooling or purifying liquids, etc.

—THE PIQUA BLOWER COMPANY, PIQUA, OHIO.

**BLOWERS.** Various hand, foot, and water-blast blowers.

—E. H. SARGENT & CO., CHICAGO, ILL.

(Other dealers see under Laboratory Supplies.)

**BLOWPIPE FURNACES.** See Furnaces, Blowpipe.

**BLOW PIPES.** Ranging in size from the smallest automaton to the largest brazing and welding blowpipes made, for use with coal gas, natural gas, or gasoline gas. Oxy-hydrogen blow pipes for lead burning, with straight and curved shaft, and six jets with varying sized orifices and wind shield.

—BUFFALO DENTAL MFG. CO., BUFFALO, N. Y.

**BLOWPIPES.** All kinds and types. Plattner's blow-pipe cabinet of Lingke's (Freiberg) make. Blow-piping set, prospector's outfit.

—EIMER & AMEND, NEW YORK CITY.

**BLOW PIPES, GASOLINE.** The Hoskins blow pipes are made in different sizes entirely of brass and are safe and convenient for chemical or assay work, heating soldering iron, brazing, etc. They operate entirely on gasoline, the pressure being developed in and supplied from their reservoir tanks.

—HOSKINS MANUFACTURING COMPANY, DETROIT, MICH.

**BLOW PIPES.** All kinds for laboratory work.

—SCIENTIFIC MATERIALS CO., PITTSBURGH, PA.

**BRIDGE. HOOPES** conductivity, consists of a modified form of Kelvin bridge, the modification consisting in an arrangement of scales, by which the percentage conductivity of the specimen being tested is directly read from the scale. It is particularly adapted

for use where it is desired to know the conductivity of large numbers of samples of metals as they are being produced, or of wires as they are being drawn. It may be arranged for wires of a large number of sizes and for wires of different metals. The instrument is capable of being used to an accuracy of  $1/20$  of a per cent.

—LEEDS & NORTHRUP CO., PHILADELPHIA, PA.

**BRIDGE. KELVIN** double bridge. Intended for the measurement of resistances of less than 1 ohm, and with it measurements may be made down to .00001 ohm with the same accuracy that higher resistances are measured on the Wheatstone Bridge. In this instrument a few fixed ratio coils are employed with an accurate variable low-resistance standard. The resistance ratio coils are built of manganin which has a very low temperature coefficient, and a negligible thermo-electromotive force against copper. It will measure resistances from 1 to .00001 of an ohm with an accuracy of better than  $1/50$  of a per cent.

—LEEDS & NORTHRUP CO., PHILADELPHIA, PA.

**BRIDGE. KOHLRAUSCH.** Slide wire. A special type of slide-wire bridge. In it the slide wire is coiled on a marble cylinder 15 cm. in diameter with total length of wire of 470 cm. There are no sliding contacts in circuit with bridge wire, and the point of contact is so connected that it affects nothing other than the sensitiveness of the combination. The sliding contact is made so that it will positively not wear the wire.

—LEEDS & NORTHRUP CO., PHILADELPHIA, PA.

**BRIDGE. LEEDS & NORTHRUP.** Slide wire. Largely used in the measurement of the conductivity of electrolytes. They are built one meter long in two types, reversible and non-reversible. The reversible type is used for work of the highest precision, and is so arranged that the terminals of the bridge may be reversed. In both types, the strap connections are of heavy copper, all joints soldered and provision made for the insertion of extension coils. The reversing type is provided with coarse and fine adjustments, and vernier enables an adjustment to be made to 0.1 millimeter.

—LEEDS & NORTHRUP CO., PHILADELPHIA, PA.

**BRIDGE, QUEEN-KOHLRAUSCH.** For measuring electrolyte conductivities with alternating current and a telephone receiver. An improved design in which are eliminated all the defects of previous forms such as contacts directly in the bridge wire circuit. The bridge contact is a new design constructed so as not to wear the wire.

—QUEEN & CO., INC., PHILADELPHIA, PA.

**BRIDGE. QUEEN-WHEATSTONE** of the plug and dial types. For general use in measuring resistances of solid conductors. The resistances are wound with manganin and are practically free from inductance and capacity so as to be used without error with rapidly alternating currents.

—QUEEN & CO., INC., PHILADELPHIA, PA.

**BRIDGE. WHEATSTONE,** and Resistance Boxes, Leeds & Northrup. The resistance material used in these instruments is manganin wire, it being wound on wooden or metal spools. These spools are mounted in each case on the polished hard rubber tops of the protecting box. Manganin has an exceedingly low temperature coefficient, and a negligible thermo-electromotive force against copper. The winding is strictly bifilar, and practically free from inductance and capacity. The coils of a given type are completely interchangeable, and are provided with copper terminals so that should an accident occur and a given coil be burned out a new coil could be mounted in the case by the user without affecting the accuracy of adjustment. The coils are carried in stock until thoroughly seasoned. The bridges are listed as the following: Dial Decade Box, Plug Decade Box, Post-Office Box, and Anthony Box. The Dial Decade is the most convenient for ordinary commercial purposes. The accuracy of adjustment ranges from 0.01 per cent in high grade standard sets, to 0.2 per cent in the commercial sets.  
—LEEDS & NORTHRUP CO., PHILADELPHIA, PA.

**BURNERS.** Heating burners of all kinds and styles. Evaporating burners of copper and cast iron, adapted for any kind or quality of gas by adapting our wheel valve or cap nut regulator. Bunsen burners, with fixed length of flame, and also adjustable burners.  
—BUFFALO DENTAL MFG. CO., BUFFALO, N. Y.

**BURNERS.** For alcohol, gasoline, kerosene, coal gas, gasoline gas and natural gas. A very large variety. Also blast lamps.  
—EIMER & AMEND, NEW YORK CITY.

**BURNERS.** For gasoline. Highest operating efficiency obtained by this design, which has been in successful use for 30 years.  
—HOSKINS MANUFACTURING COMPANY, DETROIT, MICH.

**BURNERS.** For laboratories. All kinds for use with alcohol, benzine, gasoline, natural gas, or artificial gas.  
—SCIENTIFIC MATERIALS CO., PITTSBURGH, PA.

(Other dealers see Laboratory Supplies. See also Welding, Oxy-acetylene, and Oxy-hydrogen, in Part I of this Dictionary.)

**CALORIMETERS.** For solid, liquid and gaseous fuels.  
—BAUSCH & LOME OPTICAL CO., ROCHESTER, N. Y.

**CALORIMETERS.** Emerson fuel calorimeter (a bomb calorimeter of the Berthelot type embracing the latest improvements in calorimeters) equal in accuracy to other standard bomb calorimeters although much less expensive. Graefe gas calorimeter (a handy and inexpensive substitute for the Junker calorimeter for use where extreme accuracy is not essential). Hempel's calorimeter (as described in his work on Methods of Gas Analysis). Junker's gas calorimeter recommended by the Am. Gas Institute (for measuring the calories produced per unit volume of gas; very little time is

required for taking a measurement and the instrument may be attended to by an inexperienced person). Mahler and Atwater bombs. Parr standard calorimeter (for determining the heat units in bituminous and anthracite coals, lignites, coke, petroleum, etc.) —EIMER & AMEND, NEW YORK CITY.

**CALORIMETERS.** Mahler bomb type, for measuring the calorific value of coals and heavy oils. Other various types of calorimeters described in special circular.

—WM. GAERTNER & CO., CHICAGO, ILL.

**CALORIMETER.** Sargent's for the rapid estimation of the calorific value of combustible gases. Accuracy and uniformity of results gained by weighing the water. Also Junker's gas, Mahler bomb, and Parr's calorimeter.

—E. H. SARGENT & CO., CHICAGO, ILL.

**CALORIMETERS.** Mahler Bomb, Parr standard, or Junker.

—SCIENTIFIC MATERIALS CO., PITTSBURGH, PA.

**CALORIMETER.** Rosenhain fuel. For determining the calorific value of solid or liquid fuel. The sample is of compressed, powdered solid fuel or is an absorptioo pellet soaked with liquid fuel. It is burnt under water in a current of oxygen inside a glass vessel also completely immersed in water so that the water takes up practically the whole of the heat given out. The rise of temperature in the water is read by an accurate thermometer.

—TAYLOR INSTRUMENT COMPANIES, ROCHESTER, N. Y.

**CALORIMETERS.** Parr standard, Atwater bomb, Junker gas, Emerson fuel, Mahler bomb for immediate delivery at factory prices.

—ARTHUR H. THOMAS CO., PHILADELPHIA, PA.

**CALORIMETERS.** Of various types.

—WILSON-MAEULEN CO., NEW YORK.

**CARBONIC ACID APPARATUS.** Many different designs.

—EIMER & AMEND, NEW YORK.

—HENRY HEIL CHEMICAL CO., ST. LOUIS, MO.

—E. H. SARGENT & CO., CHICAGO, ILL.

(Other dealers see Laboratory Supplies.)

**CATHETOMETERS.** A large line of various sizes and of different degrees of accuracy. Catalog M-L.

—WM. GAERTNER & CO., CHICAGO, ILL.

**CAUSTIC SODA.**

—ARNOLD, HOFFMAN & CO., PROVIDENCE, R. I.

—CASTNER ELECTROLYTIC ALKALI CO., NIAGARA FALLS, N. Y.

—HOOKER ELECTROCHEMICAL CO., NEW YORK AND NIAGARA FALLS.

—PENNSYLVANIA SALT MFG. CO., PHILADELPHIA, PA.

(Also all dealers of chemicals, see Chemicals and Laboratory Supplies.)



**CEMENT.** De Khotinsky laboratory cement. Originally prepared for making air-tight joints in incandescent lamps and vacuum tubes, but generally useful for cementing glass and metals, and also as an insulating material and a protective covering. Its specific resistance and specific inductive capacity are higher than those of mica. It is not attacked by nitric, sulphuric, and hydrochloric acids, bisulphide of carbon, benzine, gasoline, and turpentine, and very little affected by ether, chloroform, caustic alkalies, etc. Three grades: Hard cement for cementing glass, metals, porcelain, etc. Medium, for cementing and insulating purposes. Soft, for insulating and covering electric wires, for condensers and static machines, and for protection against corrosion. An especially hard material is prepared for molding insulators for high-potential purposes.

—WM. GAERTNER & CO., CHICAGO, ILL.

**CEMENT TESTING APPARATUS.** A full line of briquette molds; standard sieves and general glassware.

—EIMER & AMEND, NEW YORK.

**CEMENT TESTING APPARATUS.** Complete equipment of apparatus necessary for the chemical analysis or physical tests of cement. In our automatic cement testing machine, the weight is applied by a stream of shot which runs from a reservoir into a pail suspended at the end of a steel yard-arm and which is cut off automatically when the briquet breaks. In its improved form, it is equipped with sub-base containing a new tension attachment, to apply steady tension to briquets until broken. Capacity 1000 or 2000 lbs.

—SCIENTIFIC MATERIALS CO., PITTSBURGH, PA.

#### **CEMENT TESTING APPARATUS.**

—BAUSCH & LOMB OPTICAL CO., ROCHESTER, N. Y.

—E. H. SARGENT & CO., CHICAGO, ILL.

**CENTRIFUGAL MACHINE.** Bausch & Lomb precision centrifuge, electrically driven, with sufficient power and capacity to accommodate varied sizes of bottles in all kinds of analyses.

—BAUSCH & LOMB OPTICAL CO., ROCHESTER, N. Y.

**CENTRIFUGAL MACHINES.** E. & A. laboratory universal centrifugal machine, for hand and power. Purdy's electric centrifuge. Babcock's centrifuge. Centrifuges with water motor etc.

—EIMER & AMEND, NEW YORK CITY.

**CENTRIFUGAL MACHINES.** This firm makes a specialty of all kinds of glasses, graduated and plain, for such machines.

—THE EMIL GREINER CO., NEW YORK.

**CENTRIFUGAL MACHINES.** A rotating receptacle or receptacles for applying centrifugal force, usually to liquid or solid material, for the purpose of separating the integral parts of the mixture, *e.g.*, to

throw off mother-liquor from salts or to hasten precipitates of solid particles in a liquid. Made in two general types, the bucket type and the cylindrical or basket type; in the former type one or more pairs of cups or tubes for containing liquid are horizontally rotated about a vertical axis, in the latter type a cylinder, either solid or perforated, is rotated about its own vertical axis. The precipitating force varies directly as the distance of the particles from the axis of rotation, and directly as the square of the speed of rotation. The electric centrifuges of the International Instrument Co. are made in 5 regular sizes, the motors ranging from about  $\frac{1}{8}$  h.p. to about  $1\frac{1}{2}$  h.p. and are made in special sizes for motors up to 7 h.p. All but the smallest sizes are entirely enclosed with steel armor. Tube receptacles vary in capacity from 2 cc. to 500 cc. Cylindrical or basket receptacles from 200 cc. to 4000 cc. Maximum speeds are different for different models and vary from 1200 r.p.m. to 4000 r.p.m. For chemists, centrifuges are especially useful for two purposes, for efficient removal of mother-liquor in purification of salts (see Article by Richards, Vol. 27, 1905, p. 104, *Jour. Am. Chem. Soc.*) and for quick and complete settling of precipitates, as barium sulfate, for example, in gas analysis.

—INTERNATIONAL INSTRUMENT CO., CAMBRIDGE, MASS.

**CENTRIFUGAL MACHINE.** For the rapid approximate determination of phosphorus in steel by the Goetz method.

—E. H. SARGENT & Co., CHICAGO, ILL.

**CENTRIFUGAL MACHINES.** All kinds for all purposes.

—SCIENTIFIC MATERIALS CO., PITTSBURGH, PA.

(Other dealers see Laboratory Supplies.)

**CHEMICAL APPARATUS.**

—BAUSCH & LOMB OPTICAL CO., ROCHESTER, N. Y.

(See also Laboratory Supplies.)

**CHEMICALS.** Chemically pure ammonium hydrate, chemical salts, and reagents. Full particulars and prices on request.

—THE BAKER & ADAMSON CHEMICAL CO., EASTON, PA.

**CHEMICALS.** "Baker's Analyzed Chemicals." Every label shows an analysis, and our guarantee provides that the contents of each bottle will conform with that analysis. Price lists on request.

—J. T. BAKER CHEMICAL CO., PHILLIPSBURG, N. J.

**CHEMICALS.** Heavy and fine chemicals, drugs, oils, wax, minerals, etc. Nickel, antimony, and other metals. Stearine pitch, nickel salts. A full line of varnish dryers.

—FURST BROS. & Co., NEW YORK CITY.

**CHEMICALS.** Chemically pure ammonium hydrate, chemical salts and reagents.

—GENERAL CHEMICAL CO., NEW YORK.

—GENERAL CHEMICAL CO. OF PENNA., PITTSBURGH, PA.

**CHEMICALS.** "Let Merck make the "Blank Test" for you. To that end, buy Merck's Blue Label Reagents."

—MERCK & CO., NEW YORK, ST. LOUIS, RAHWAY, N. J.

**CHEMICALS.**

—ROESSLER & HASSLACHER CHEMICAL CO., NEW YORK CITY.

**CHEMICALS AND CHEMICAL APPARATUS.** A complete line of technical chemicals for analytical and assay work. Apparatus to meet general laboratory requirements, as well as apparatus for gas analysis, cement testing, blow-pipe analysis, sugar analysis, iron and steel analysis, etc., etc.

—QUEEN & CO., INC., PHILADELPHIA, PA.

**CHEMICALS,** Commercial and chemically pure acids and ammonia, anhydrous ammonia, liquid carbonic acid gas, electrolyte.

—THE WESTERN CHEMICAL MFG. CO., DENVER, COLO.

**CHLORIDE OF PLATINUM.** Potassium platinum chloride and any other platinum salt.

—AMERICAN PLATINUM WORKS, NEWARK, N. J.

**CHLORINE** and chlorine products, like bleaching powder.

—ARNOLD, HOFFMAN & CO., PROVIDENCE, R. I.

—CASTNER ELECTROLYTIC ALKALI CO., NIAGARA FALLS, N. Y.

—HOOKER ELECTROCHEMICAL CO., NEW YORK.

—PENNSYLVANIA SALT MFG. CO., PHILADELPHIA, PA.

(Also general dealers in chemicals, see Chemicals.)

**CIRCUIT TESTERS, WESTON.** See Instruments, Weston Standard.

—WESTON ELECTRICAL INSTRUMENT CO., WAVERLY PARK, NEWARK, N. J.

**COAL TESTING APPARATUS.** A complete line of calorimeters for B. t. u. test, sulphur, ash and carbon determination apparatus, sieves, balances, and grinders for preparing coal samples.

—EIMER & AMEND, NEW YORK CITY.

**COLORIMETER.** Leed's, Stammer's Dubosc-Soleil's, Lavibond's tintometer for the analysis, accurate measuring, and recording of all colors, for chemists, dyers, brewers, tanners, sugar refineries, flouring mills, oil refineries, soap and paper manufacturers, etc.

—EIMER & AMEND, NEW YORK CITY.

**COLORIMETER** and Tintometer. Ives patent for commercial purposes, for accurate analysis and recording of all colors. Special catalog.

—WM. GAERTNER & CO., CHICAGO, ILL.

**COLORIMETER.** Kennicott-Sargent. An improved form of the Kennicott apparatus. Permits great rapidity of operation, while maintaining highest efficiency.

—E. H. SARGENT & CO., CHICAGO, ILL.

(Other dealers see Laboratory Supplies.)

**COMBUSTION APPARATUS.** For the determination of carbon in steel, ferro-alloys and graphite, by the use of the new combustion train of C. M. Johnson, together with our No. 17 tube furnace, operated by gas. Write for illustrated and descriptive brochure.

—BUFFALO DENTAL MFG. CO., BUFFALO, N. Y.

**COMBUSTION APPARATUS.** E. & A. carbon combustion crucible, so arranged that the entering air or oxygen is superheated and does not blow directly upon the substance to be treated. The gases CO and CO<sub>2</sub> escaping slowly through a chamber in the top of the apparatus which is provided with granulated copper oxide to effect perfect oxidation, doing away with the cumbersome water-cooling and special CuO-tube. In this crucible combustions are made in about half the usual time without any loss of material and without use of rubber joints. It may be provided with stirring arrangement, and can be had of straight or conical form to admit a Gooch crucible, saving transferring. Apparatus designed by C. M. Johnson for determination of carbon in iron, steel, ferro-alloys and plumbago.

—EIMER & AMEND, NEW YORK CITY.

**COMBUSTION APPARATUS.** Shimer-Sargent. For the determination of carbon in steel by the direct or precipitation combustion methods with the assistance of air or oxygen.

—E. H. SARGENT & CO., CHICAGO, ILL.

**COMBUSTION APPARATUS.** C. M. Johnson's. For the determination of carbon in iron, steel, ferro-alloys, etc. A complete combustion in steel can be made in 25 minutes, including all operations. Very compact and with the exception of the connections to the combustion tube there are no rubber stoppers in the entire train, glass goosenecks being used to avoid stoppers. The electric furnace is very economical and radiates very little heat. Operates equally well on either alternating or direct current at either 110 or 220 volts, also made to order for other voltages up to 220. By making a "Y" connection two furnaces can be operated together, thus saving considerable time. (See Scientific Materials Co's. advertisement in *Electrochemical and Metallurgical Industry*, May, 1909).

—SCIENTIFIC MATERIALS CO., PITTSBURGH, PA.

**COMBUSTION BOATS.** Made of a new substance that is practically indestructible, with a binder of high heat resisting qualities insuring a boat of exceedingly long service.

—BUFFALO DENTAL MFG. CO., BUFFALO, N. Y.

**COMBUSTION CRUCIBLE.** Aupperle for carbon determination gives rapid and accurate results. Capacity 60 cc. weight 105 grams.  
—J. BISHOP & Co., PLATINUM WORKS, MALVERN, PA.  
(Other dealers see Laboratory Supplies.)

**COMBUSTION FURNACES.** See Furnaces, Combustion.

**CONDENSERS** Queen, for precision measurements of capacity in single and subdivided values of mica and adjusted to an accuracy of  $\frac{1}{4}$  of 1%. Also condensers for measurements of less accuracy and which are termed "commercial" of mica and adjusted to an accuracy of 1%. A convenient form is 1 microfarad divided into sections of 0.05, 0.05, 0.2, 0.2, and 0.5 M. F. and so arranged that the subdivisions can be combined in series or parallel.  
—QUEEN & Co., PHILADELPHIA, PA.

**CONDUCTIVITY.** Measurements. See Bridge.

**CRUCIBLE FURNACES.** See Furnaces, Crucible.

**CRUCIBLES.** All kinds and sizes for assay and experimental work. Made of Hessian Sand, Black Lead, French clay, iron, nickel, platinum, porcelain or silver.  
—J. & H. BERGE, NEW YORK CITY.

**CRUCIBLES.** Plumbago crucibles. "Buffalo clay" crucibles. made of the most refractory clay known, readily resisting temperatures to nearly 1800° C. Clay covers. Catalog B.  
—BUFFALO DENTAL MFG. CO., BUFFALO, N. Y.

**CRUCIBLES** of carbon and graphite.  
—INTERNATIONAL ACHESON GRAPHITE CO., NIAGARA FALLS, N. Y.

**CRUCIBLES** of carbon and graphite.  
—NATIONAL CARBON CO., CLEVELAND, OHIO.

**CRUCIBLES.** Made of porcelain, nickel, copper, iron, clay, plumbago, silver or platinum.  
—SCIENTIFIC MATERIALS CO., PITTSBURGH, PA.

**CRUCIBLES** of platinum. See Platinum. Other dealers in crucibles see Laboratory Supplies.

**CRUSHERS** and grinding mills, etc., for sampling and laboratory work.  
—COLORADO IRON WORKS CO., DENVER, COLO.

**CRUSHERS** for laboratory purposes. Our hand sample grinder fitted with special jaws is the most satisfactory machine for preparing coal samples for calorimeter tests.  
—EIMER & AMEND, NEW YORK CITY.

**CRUSHERS.** For laboratory. Extra heavy and high grade, output from  $\frac{1}{8}$  "to  $\frac{1}{2}$ ", capacity 100 to 600 lbs. per hour.

—STURTEVANT MILL CO., BOSTON, MASS.

**CRUSHING AND GRINDING BALL MILLS.** Hard porcelain or gray earthenware. For hand or machine power. Very durable and answering the same purpose as the genuine porcelain mills, but not as expensive.

—J. W. SITTIG, NEW YORK.

**CRUSHING AND GRINDING. JAR MILL.** Laboratory. "The Little Trojan" a porcelain jar mill for handling from a few ounces up to 5 pounds at a charge. Also built with 2, 4, 6 and 12 jars of the same size to handle a number of different products at once.

—ABBE ENGINEERING CO., NEW YORK.

**CRUSHING ROLLS.** Extra heavy, high grade rolls, have a range of output of from  $\frac{1}{2}$ " to 60 mesh; easily accessible and easily cleaned, size 8" x 5".

—STURTEVANT MILL CO., BOSTON, MASS.

(Crushing and Grinding machinery for large-scale commercial work see in the first part of this Dictionary under Crushing and Grinding.)

**DISTILLING Apparatus.** See Still; also Distilling and Stills in Part I of this Dictionary.

**DIVIDING MACHINES** linear and circular, for commercial and laboratory purposes. Catalog M-L.

—WM. GAERTNER & CO., CHICAGO, ILL.

**DRAFT GAUGE.** Our draft gauge is designed for indicating very light draft pressure, and is graduated to read in millimeters or in inches of water pressure. Extensively used on kilns, flues, furnaces, etc., where it is desirable to know the draft changes.

—BROWN INSTRUMENT CO., PHILADELPHIA, PA.

**DRAFT GAUGES.** Recording. Pressure and vacuum gauges for all commercial ranges or pressure and vacuum. Full description in Bulletin 104.

—BRISTOL CO., WATERBURY, CONN.

(See also Micro-Manometer.)

**DRAWING INSTRUMENTS AND PAPERS.** All instruments for the drawing room, drawing tables, T squares, triangles, curves. Drawing papers for all purposes, blue print papers, profile and cross section papers.

—QUEEN & CO., INC., PHILADELPHIA, PA.

**ELECTRIC FURNACES.** See Furnaces, Electric in this part and also in part I of this Dictionary.

**ELECTRO-ANALYSIS.** Electrolytic decomposition and deposition apparatus. Electrolytic supports.

—EIMER & AMEND, NEW YORK CITY.

**ELECTRO-ANALYSIS.** Rotating electrode apparatus, B. F. Weston's. For rapid determination of metals. Arranged to use any style of electrodes, such as platinum dishes, crucibles, spirals, gauze, or the newer mercury cathode cell. By using a platinum crucible or dish, and a piece of platinum foil or gauze, to be found in most laboratories, the extra expense of special electrodes is avoided. Complete apparatus for electro-analysis, in practical use for the determination of antimony, cadmium, copper, iron, lead, mercury, nickel, silver, tin, and zinc.

—SCIENTIFIC MATERIALS CO., PITTSBURGH, PA.

**ELECTRO-QUARTZ.** See Quartz, Fused, Opaque.

**EXTENSOMETER.** Cambridge Patent. The elastic extension of the test piece is measured to within  $1/25000$  inch without the use of mirrors or microscopes. Particularly suitable for use in a works laboratory. Quickly adjusted and read. Apparatus for marking off the test piece is also supplied.

—TAYLOR INSTRUMENT COMPANIES, ROCHESTER, N. Y.

**EXTENSOMETER** Ewing. An instrument for the measurement of small variations in length in a sample subjected to tensile or compressive stresses. The elastic extension of the test piece is measured and read by means of a micrometer scale in the eye piece of a microscope. By estimation of tenths of a division on the micrometer scale readings may be made down to  $1/50000$  inch. In addition to the usual form for the measurement of elastic elongation under tension, a pattern is made for measuring elastic compression of short blocks. Suitable marking off apparatus is supplied for use with the above instrument.

—TAYLOR INSTRUMENT COMPANIES, ROCHESTER, N. Y.

**EXTRACTION APPARATUS** for extracting with any solvent.

—BAUSCH & LOMB OPTICAL CO., ROCHESTER, N. Y.

**FILTER PAPER.** Baker's "ashless filters," made of the finest Swedish hand-made filter paper extracted with HCl and HF. Also "washed filters," washed in hydrochloric acid only.

—J. T. BAKER CHEMICAL CO., PHILLIPSBURG, N. J.

**FILTER PAPER** and Filters.

—BAUSCH & LOMB OPTICAL CO., ROCHESTER, N. Y.

**FILTER PAPER.** German and Swedish ashless Filters. Our own B brand is the most efficient cheap filter for general use.

—J. & H. BERGE, NEW YORK CITY.

**FILTER PAPER.** We are the sole agents for the filtering paper manufactured by Max Dreverhoff, Dresden-N. It is made throughout from finest, carefully selected stock, is strong, pure, and uniform, insuring the retention of the finest precipitates and uniform results in filtration. It is made in so many grades, that suitable paper for any purpose can be found among them.

—HENRY HEIL CHEMICAL CO., ST. LOUIS, MO.

**FILTER PAPER.** We are the sole agents for J. H. Munktell's Swedish filter papers of highest quality.

—E. H. SARGENT & CO., CHICAGO, ILL.

**FILTER PAPERS.** All kinds.

—SCIENTIFIC MATERIALS CO., PITTSBURGH, PA.

**FILTER PAPERS.** Ashless. Of superior quality.

—THE BAKER & ADAMSON CHEMICAL CO., EASTON, PA.

**FILTER PAPERS.** S. & S. Munchtells, Dreverhoff, etc. We are sole U. S. agents for the filter papers of Schleicher & Schnell, Dueren, Germany, but also make a cheap, yet efficient E. & A. brand of filter paper for general use.

—EIMER & AMEND, NEW YORK CITY.

**FILTER PRESSES.** See Part I of Dictionary.

**FILTERS, WATER.**

—ARTHUR H. THOMAS CO., PHILADELPHIA, PA.

**FIRE-CLAY GOODS.** We are the agents for the fire-clay goods, made by The Morgan Crucible Co. Ltd. (Battersea Works), London, such as crucibles, scorifiers, muffles, roasting dishes and annealing cups. They are made of most refractory fire-clay and answer all purposes for which the expensive French crucibles are used. They are strong and rarely break in transportation. The Battersea crucibles can be employed for all operations for which Hessian crucibles are used and are incomparably superior to them in absorbing only one-twelfth the weight of metal, in resisting the action of corrosive fluxes, in shape, in being sold in single sizes instead of nests, and in being lighter.

—HENRY HEIL CHEMICAL CO., ST. LOUIS, MO.

**FLASKS.** All shapes and sizes for laboratory work, of best Bohemian or Jena glass.

—SCIENTIFIC MATERIALS CO., PITTSBURGH, PA.

(Other dealers see Glassware, also Laboratory Supplies.)

**FURNACES.** Of all kinds for chemical laboratory and assay work. Crucibles, muffles, etc.

—HENRY HEIL CHEMICAL CO., ST. LOUIS, MO.



**FURNACES, ASSAY.** Hibbs and other types of our own manufacture.

—J. & H. BERGE, NEW YORK CITY.

**FURNACES, ASSAY.** Our combined crucible and muffle furnace, which can be used for crucible fusions or muffle work at the will of the operator, is unexcelled for assaying and can be used with any kind or quality of gas. Temperatures of 2800° F. are readily obtainable.

—BUFFALO DENTAL MFG. CO., BUFFALO, N. Y.

**FURNACES, ASSAY.** A great many different types, E. & A's., Fletcher's, Braun, Case, etc., for coal, gas (blast or draft), gasoline (blast), kerosene (blast).

—EIMER & AMEND, NEW YORK CITY.

**FURNACES, ASSAY.** Electrically operated; temperatures above 3000° F. obtained readily, if wanted. For crucible melting, cupelling and general assay work the electrical control of these furnaces makes them unexcelled in connection with mining laboratory work.

—HOSKINS MANUFACTURING COMPANY, DETROIT, MICH.

**FURNACES, ASSAY.** Brown's and other types.

—E. H. SARGENT & Co., CHICAGO, ILL.

**FURNACES, ASSAY.** All kinds of furnaces for assaying and general laboratory work.

—SCIENTIFIC MATERIALS CO., PITTSBURGH, PA.

**FURNACES, ASSAY.** Other dealers see under Laboratory Supplies.

**FURNACES, BLOWPIPE.** Miniature furnaces of fire clay for small tests, supported over a high-power blast bunsen burner by means of an adjustable support. Catalog B.

—BUFFALO DENTAL MFG. CO., BUFFALO, N. Y.

**FURNACES, BLOWPIPE.** Operated by gasoline. In muffle, crucible and combination designs. "Hoskins" blowpipes were the pioneer applications of gasoline under pressure. Their successful use covers a period of 30 years.

—HOSKINS MANUFACTURING COMPANY, DETROIT, MICH.

**FURNACES, COMBUSTION** Assayers, etc.

—BAUSCH & LOMB OPTICAL CO., ROCHESTER, N. Y.

**FURNACES, COMBUSTION.** Operated by air blast or direct draft, for use with coal gas, natural gas or gasoline gas. Will accommodate combustion tubes up to 1 inch diameter. Burner has a series of shut-offs by means of which the flame can be adjusted to any section of the tube desired.

—BUFFALO DENTAL MFG. CO., BUFFALO, N. Y.

**FURNACES, COMBUSTION.** Bunsen's, Fuchs', Glaser's, Liebig's and others. Sectional electric combustion furnace for progressive heating from rear to front end.

—EIMER & AMEND, NEW YORK CITY.

**FURNACE, COMBUSTION.** Electrically operated; especially designed for laboratory determinations of carbon in steel, ferro-alloys and graphite—by the "Direct Combustion Method". Their use will effect a complete combustion in 25 minutes. Clean, simple, operates directly on standard electric lighting circuits.

—HOSKINS MANUFACTURING COMPANY, DETROIT.

**FURNACES, COMBUSTION.** Bunsen's, Glaser's and other types.  
—E. H. SARGENT & Co., CHICAGO, ILL.

(Other dealers see Laboratory Supplies.)

**FURNACES, CRUCIBLES.** Operated by air blast or direct draft, for use with coal gas, natural gas, gasoline gas or kerosene oil. Catalog B.

—BUFFALO DENTAL MFG. Co., BUFFALO, N. Y.

(Other dealers see Laboratory Supplies.)

**FURNACE, ELECTRIC.** Quartz-lined, which permits to heat it up quickly without danger of cracking its interior. For hardening small tools, determining the recalcrescent points of steel, and general laboratory work. Used in connection with the Bristol recording pyrometer.

—BRISTOL Co., WATERBURY, CONN.

**FURNACES, ELECTRIC.** For chemical work in the laboratory, A complete line of all types. E. & A. sectional crucible, muffle and combustion furnace. Borchers universal resistance and arc furnace. Various sizes of electric furnaces of the Moissan type. Roessler's electric melting furnace for continuous work. Hertzfeld's electric muffle furnace. Hoskins electric muffle furnaces. Electric drying ovens of various sizes and constructions.

—EIMER & AMEND, NEW YORK CITY.

**FURNACE, ELECTRIC.** Heraeus. Indispensable for exact heat determinations in laboratories. Write for pamphlet.

—CHARLES ENGELHARD, NEW YORK.

**FURNACES, ELECTRIC.** Hoskins electric furnaces are made in three types, FA, FB, FC—all of these being manufactured in crucible, muffle and tube chambers of various sizes. They are adaptable to a wide range of commercial and experimental uses. Type FA furnaces are wire-wound for standard voltages, either alternating-current or direct-current circuits, and produce temperatures as high as 1000° C. or 1832° F. Type FB furnaces are made of heavy wire for low-voltage, alternating-current circuits only, and produce temperatures as high as 1100° C. or 2012° F. Type FC furnaces

are of the carbon resistor type for alternating-current circuits only, capable of developing temperature up to 2000° C. or 3600° F. These furnaces, due to their electrical operation, produce heat entirely free from products of combustion, and develop absolutely uniformly-distributed temperature which can be exactly controlled.

—HOSKINS MANUFACTURING COMPANY, DETROIT.

**FURNACES, ELECTRIC.** Small electric furnaces for high-temperature reactions are most satisfactorily made using pure graphite for electrodes, containers and resistor. Ease of machining and joining affords economy in producing any desired shape, or style of connection. Tubes, crucibles, rods, blocks and plates 99% graphite can be had, assuring no contamination of the charge. Granular graphite resistor affords reasonably uniform resistance and heating, with freedom from volatile matter.

—INTERNATIONAL ACHERSON GRAPHITE CO., NIAGARA FALLS, N. Y.

**FURNACE, ELECTRIC.** For moderate temperatures as 50° to 300° C. The international Instrument Company's oven's regular size is 12" x 12" x 12" with one middle shelf; copper lined, for temperatures up to 130 degrees C. Wood cabinets with heavy interior insulation, ventilating air space, metal lining, tubules for thermometers, mercury thermo-regulator, and ventilation, outside regulating resistance and relay control, operating on 110-volt a.c. or d.c.

—INTERNATIONAL INSTRUMENT CO., CAMBRIDGE, MASS.

**FURNACES, ELECTRIC.** Hoskins combination crucible and muffle type. Also a full line of electric ovens of stamped steel on cast iron frames, ranging in sizes from 12 in. square to 13 x 15 x 18 in. operated with either alternating or direct current.

—E. H. SARGENT & Co., CHICAGO, ILL.

**FURNACES, ELECTRIC.** For use in the laboratory.

—SCIENTIFIC MATERIALS CO., PITTSBURGH, PA.

**FURNACES, ELECTRIC.** For laboratories. Dealers in most approved types of electric laboratory furnaces, both of domestic and foreign manufacture, at manufacturer's prices.

—ARTHUR H. THOMAS CO., PHILADELPHIA, PA.

(For large electrical furnaces see Part I of this Dictionary.)

**FURNACES, GASOLINE.** Hoskins gasoline furnaces are made in crucible, muffle, and combination crucible and muffle types of various sizes, applicable to a variety of chemical and assay work. Among other types, a compact portable outfit is made. Several sizes of gasoline blow-pipes are manufactured to operate in connection with these. The standard of 30 years.

—HOSKINS MANUFACTURING COMPANY, DETROIT, MICH.

**GALVANOMETERS.** Dead-beat and ballistic 'D'Arsonval galvanometers. Any desired resistance. Sensitiveness 0.1 micro-

coulomb gives a deflection of 35 mm. at a meter distance. Period about 12 seconds.

—WM. GAERTNER & Co., CHICAGO, ILL.

**GALVANOMETERS, D'ARSONVAL.** This type of galvanometer consists of a coil of wire freely suspended between the poles of a permanent magnet. This type is most generally used in present day practice because of its freedom from interference by exterior magnetic fields. The sensibility of the galvanometer is defined in one of three ways:—(1) in megohms, the sensibility being the number of megohms through which one volt will produce a deflection of 1 mm. with the scale at 1 meter distance. (2) In microvolts, the sensibility being the number of microvolts which applied directly to the terminals of the galvanometer will produce a deflection of 1 mm. on a scale 1 meter from the mirror. (3) In current, the sensibility being the fraction of an ampere that will give 1 mm. deflection at 1 meter.

—LEEDS & NORTHRUP Co., PHILADELPHIA.

**GALVANOMETER. PORTABLE D'ARSONVAL.** Made in two types (1) The pointer type resembles a small portable voltmeter. Its sensibility is such that the current from one volt through a resistance of 500,000 ohms will cause the pointer to move one mm. over the scale. Its over-all dimensions are  $5\frac{1}{2}$ " x  $2\frac{3}{4}$ " x  $4\frac{1}{2}$ ". It is amply sensitive for checking ammeters and voltmeters to an accuracy of 1/5% by the potentiometer method, and for almost all Wheatstone Bridge measurements to commercial accuracies. It requires no levelling whatever. It has a suspended system so protected that breakage due to dropping, etc., is almost impossible. (2) The portable telescope galvanometer requires no levelling, is completely portable, and will stand as much rough usage as an ordinary voltmeter. It has a scale of 400 divisions which when viewed through a reading telescope appears as though it were 400 mm. long. Complete with the reading telescope, it occupies but slightly more space than does an ordinary voltmeter. The current from one volt through seven megohms will cause a deflection of one scale division. It requires no light other than ordinary daylight.

—LEEDS & NORTHRUP Co., PHILADELPHIA, PA.

**GALVANOMETERS, REFLECTING.** Leeds and Northrup. Intended for use with telescope and scale, or with lamp and scale. The moving systems are at all times visible, and all parts are interchangeable. The deflections are approximately proportional to the current, or for ballistic measurements to the quantities of electricity discharged. The systems do not oscillate but deflect quickly and come promptly to rest either deflected or at zero. New suspensions can be easily replaced by the user. No delicate adjustments are required to get the coil to swing free. They are supplied with the following typical sensibilities:—

Type HS. Resistance 1600 ohms, sensibility 1000 megohms.

Resistance 30 ohms, sensibility .15 microvolts

Type H. Resistance 460 ohms, sensibility 300 megohms or  $3\frac{1}{2} \times 10^{-9}$  amp.

Resistance 2000 ohms, sensibility 1000 megohms or  $10^{-9}$  ampere.

Resistance 30 ohms, sensibility .2 micro-volt, or  $7 \times 10^{-9}$  ampere.

Type P. Resistance 100 ohms, sensibility 80 megohms.

Ballistic Type. Resistance 2000 ohms, sensibility .0045 micro-coulomb. Steady current sensibility 600 megohms. Time of ballistic throw from zero to end of deflection 5 seconds.

—LEEDS & NORTHRUP CO., PHILADELPHIA, PA.

**GALVANOMETERS, Queen.** Designed to meet the varying requirements of galvanometer practice. The D'Arsonval type is now universally used. These instruments can be furnished with high, medium, and low resistance coils. The systems are made for pivots and jewels or for suspensions with mirror and telescope and scale.

—QUEEN & CO., PHILADELPHIA, PA.

**GALVANOMETERS, WESTON.** See Instruments, Weston Standard.

—WESTON ELECTRICAL INSTRUMENT CO., WAVERLY PARK, NEWARK, N. J.

**GAS ANALYSIS.** Barnhart's apparatus for the analysis of blast furnace, producer, flue, illuminating and fuel gases. The time required for a complete analysis of coal or producer gas with this apparatus is about 20 minutes. Also Hempel's apparatus for gas analysis, as described in his work "Methods of Gas Analysis." Orsat Apparatus, the most popular for flue and furnace gas analysis. Drehschmidt's apparatus for determining sulphur in coal gas. Ruedorff's CO<sub>2</sub> apparatus. Reich's apparatus for determining SO<sub>2</sub> in lead chambers. Petterson & Palmquist's CO<sub>2</sub> apparatus and improved portable form designed by Dr. Rogers for exact determination of CO<sub>2</sub> in air. Apparatus according to Bunsen's gasometric methods. Apparatus of Elliott, Orsat, Tuttle, Winkler, etc.

—EIMER & AMEND, NEW YORK CITY.

**GAS ANALYSIS APPARATUS.** This firm carries in stock Orsat & Hempel's apparatus of the most improved forms, and also makes up to order such apparatus according to special designs.

—THE EMIL GREINER CO., NEW YORK.

**GAS ANALYSIS APPARATUS.** A complete stock of all the improved apparatus for the analysis of all kinds of gases.

—SCIENTIFIC MATERIALS CO., PITTSBURGH, PA.

(Other dealers see Laboratory Apparatus.)

**GAS APPARATUS.**

—BAUSCH & LOMB OPTICAL CO., ROCHESTER, N. Y.

**GAS BURETTE.** We are the makers of Morehead's gas burette. While sacrificing none of the accuracy of the Hempel, Orsat, or

McIntosh-Elliott burettes, it greatly decreases the time necessary for an analysis. We also handle other gas analytic apparatus.

—E. H. SARGENT & Co., CHICAGO, ILL.

**GAS FILTER** and dust determinator, with electric heater. Designed by Mr. William Brady of Illinois Steel Co., for the analysis of blast furnace gases to be used in gas engines.

—E. H. SARGENT & Co., CHICAGO, ILL.

**GAS GENERATORS.** For laboratories. All kinds.

—EIMER & AMEND, NEW YORK.

—HENRY HEIL CHEMICAL CO., ST. LOUIS, MO.

—E. H. SARGENT & Co., CHICAGO, ILL.

—SCIENTIFIC MATERIALS CO., PITTSBURGH, PA.

—ARTHUR H. THOMAS CO., PHILADELPHIA, PA.

**GAS LEAK INDICATOR.** When the indicator is brought into an atmosphere charged with gas, the gas diffuses through the porous tile into the closed chamber with greater rapidity than the enclosed air passes out, thus causing a pressure upon the elastic surface. The maximum effect of the gas is attained in two or three minutes, when the index hand ceases to move. The graduations on the dial denote the percentage of gas and the index shows the amount present.

—TAYLOR INSTRUMENTS COMPANIES, ROCHESTER, N. Y.

**GASOLINE FURNACES.** See Furnaces, Gasoline.

**GASOLINE GAS MACHINES.** The Esa generator for supplying up to 10 burners or 2 blast lamps, and machines for larger requirements.

—EIMER & AMEND, NEW YORK CITY.

**GLASS TUBING AND CONNECTIONS.** Various shapes of glass tubing such as L's, T's, adapters, etc., for pipe connections in chemical works.

—THE EMIL GREINER CO., NEW YORK.

**GLASSWARE.** Graduated, Bausch & Lomb. In addition to our regular graduated glassware, we supply a full line of graduated pieces, each accompanied by a certificate of accuracy showing errors, if any, existing. Our glassware is made at our own factory in Germany, which is equipped with the most modern apparatus for the production of high-grade graduated glassware with clear, uniformly accurate graduations. Our precision glassware is made to conform to the requirements of the U. S. Bureau of Standards. This glassware is supplied with or without certificate of the Bureau of Standards as may be desired. Glassware bearing the stamp of the German Imperial Commission imported to order.

—BAUSCH & LOMB OPTICAL CO., ROCHESTER, N. Y.

**GLASSWARE.** Best quality of beakers and flasks from the factory of Joseph Kavalier, meeting the requirements of up-to-date laboratories. Our German graduated glassware is unexcelled for accuracy and uniformity.

—J. AND H. BERGE, NEW YORK CITY.

**GLASSWARE.** Our Jena normal glassware and Josef Kavalier's Bohemian glassware meet the requirements of the Bureau of Standards. We also stock a cheaper grade of Bohemian glassware. Also resistance glass of Greiner & Friedrichs. We have an up-to-date and fully equipped glass blowing establishment on the premises and are prepared to furnish any special apparatus, no matter how complicated, on short notice.

—EIMER & AMEND, NEW YORK CITY.

**GLASSWARE, BOHEMIAN NORMAL** Henry Heil Chemical Co's. The glassware marketed under this name bears a distinctive label and is made of a special composition of Bohemian glass, which has a higher resistance to changes in temperature and the corrosive action of chemical compounds than any other known glass. It is perfect in shape, uniform in thickness, and annealed with the greatest care. Also Jena normal glassware and genuine porcelain ware.

—HENRY HEIL CHEMICAL CO., ST. LOUIS, MO.

**GLASSWARE.** Such as beakers, flasks, etc., from the best factories in Bohemia and Germany.

—THE EMIL GREINER CO., NEW YORK.

(Other dealers see Laboratory Supplies. See also Quartz, Fused.)

**GROUND DETECTORS, WESTON.** See Instruments, Weston Standard.

—WESTON ELECTRICAL INSTRUMENT CO., WAVERLY PARK, NEWARK, N. J.

**HEATER, WATER.** By a specially constructed tap, the gas and water are turned on simultaneously and hot water produced instantly. The speed at which the water runs rules its temperature. Capacities one pint to one quart per minute. Catalog B.

—BUFFALO DENTAL MFG. CO., BUFFALO, N. Y.

**HEATING APPARATUS, ELECTRIC.** For distilling inflammables without danger. Electric coil heaters for immersion in water, paraffin, tuluol, etc., for one or three heats.

—EIMER & AMEND, NEW YORK CITY.

(Other dealers in heating apparatus see Laboratory Supplies.)

**HEATING APPARATUS, ELECTRIC.** Laboratory devices for the development of heat by means of electrical resistance. No

combustion whatever in the operation of these appliances. Temperature may be accurately and simply controlled.

—HOSKINS MANUFACTURING COMPANY, DETROIT, MICH.

**HOT PLATES.** For two, three, and five burners; equipped with wheel valves which adapt them to burn any kind or quality of gas. Catalog B.

—BUFFALO DENTAL MFG. CO., BUFFALO, N. Y.

**HOT PLATES** electric. Circular and square, of various sizes.

—EIMER & AMEND, NEW YORK CITY.

**HOT PLATES.** Electrically operated; built in four standard designs; two circular, one square—"centrally heated," one 18 in. x 12 in.—with three heat control. Produce temperatures as high as 483° C. (900° F.) Operate directly on standard electric power circuits of either direct or alternating current. The cleanest Hot-Plates made.

—HOSKINS MANUFACTURING COMPANY, DETROIT, MICH.

**HOT PLATES.** Electric. Rectangular with one or three heating units. Circular hot plates for heating flasks, provided with ring top of copper and controlling switch, giving three heat ranges. Also a one-heat type. For alternating or direct current.

—E. H. SARGENT & CO., CHICAGO, ILL.

(Other dealers see Laboratory Supplies.)

**HYDROGEN.** Producing of. See Part I of Dictionary.

**HYDROMETERS** for all purposes.

—BAUSCH & LOMB OPTICAL CO., ROCHESTER, N. Y.

**HYDROMETERS** for acids, oils, bark, alcohol, sugar, etc., of various ranges. E. & A. patented hydrometer for both liquids and solids in small and large bulk.

—EIMER & AMEND, NEW YORK.

**HYDROMETERS.** All scales and ranges for different liquids.

—SCIENTIFIC MATERIALS CO., PITTSBURGH, PA.

(Other dealers see Laboratory Supplies.)

**HYDROMETERS.** Manufacture of hydrometers in shop. All instruments guaranteed.

—THE EMIL GREINER CO., NEW YORK.

**HYDROMETERS** for all purposes, made in various grades for ordinary commercial work up to the highest type of standard instruments.

—TAYLOR INSTRUMENT COMPANIES, ROCHESTER, N. Y.



**HYGROMETERS.** All forms of hygrometers, especially the hygrodeik, which is a hygrometer complete in itself—not requiring the use of tables for determining the humidity.

—TAYLOR INSTRUMENT COMPANIES, ROCHESTER, N. Y.

**INSTRUMENTS.** A complete line of recording instruments; ammeters, voltmeters, wattmeters, thermometers, pyrometers, pressure gauges, etc.

—BRISTOL CO., WATERBURY, CONN.

**INSTRUMENTS.** All kinds of instruments for use in laboratories. Electrical laboratory instruments of Hartmann & Baum.

—EIMER & AMEND, NEW YORK CITY.

**INSTRUMENTS** of precision. Measuring instruments. Optical instruments. Measuring microscopes. Micrometers. Level testers. Reckoning machines, Cathetometers. Comparators for measuring spectra photographs, scabs, etc. Dividing machines. Physical demonstration apparatus. Spectrometers. Chronographs. Catalog M-L.

—WM. GAERTNER & CO., CHICAGO, ILL.

**INSTRUMENTS.** Complete stock of all instruments for scientific and commercial laboratories.

—HENRY HEIL CHEMICAL CO., ST. LOUIS, MO.

**INSTRUMENTS.**

—HOSKINS MANUFACTURING COMPANY, DETROIT, MICH.

**INSTRUMENTS.** Engineering and drawing instruments including a complete line of transits and levels, recognized standards; physical and chemical apparatus for demonstration and laboratory work, assay apparatus, meteorological instruments, as used by the U. S. Weather Bureau, barometers, hydrometers, thermometers, pyrometers, and instruments for measuring temperature. Electrical testing instruments for commercial and laboratory work, including portable testing sets, galvanometers, resistance measuring instruments, potentiometers, and Kohlbrausch bridges, X-ray apparatus, and accessories.

—QUEEN & CO., INC., PHILADELPHIA, PA.

**INSTRUMENTS.** Electrical measuring and controlling instruments for laboratory and commercial uses.

—SIEMENS AND HALSKE CO., NEW YORK CITY.

**INSTRUMENTS.** Westinghouse Electrical Voltmeters, ammeters, wattmeters, milliammeter, power-factor meters, frequency meters, portable series and voltage transformers.

—WESTINGHOUSE ELECTRIC & MFG. CO., PITTSBURGH, PA.

**INSTRUMENTS.** Westinghouse Portable and Precision Instruments. Precision ammeters, voltmeters, wattmeters, resistance boxes, portable standard ammeters, voltmeters, wattmeters, power factor meters, frequency meters, series and voltage transformers.  
—WESTINGHOUSE ELECTRIC & MFG. CO., PITTSBURGH, PA.

**INSTRUMENTS, WESTON STANDARD ELECTRICAL.** Direct-reading voltmeters, millivoltmeters, voltammeters, ammeters, milliammeters, ground detectors, galvanometers, ohmmeters, and circuit testers, for portable, station, and laboratory use. The moving element in the instruments is a light coil of wire on which is mounted an index or pointer, and through which a certain proportion of the current passes, causing deflection of the coil in the magnetic field by which it is encompassed. For the direct-current instruments, a permanent steel magnet produces the magnetic field, being so designed as to make the field uniform. In the alternating-current instruments the field is produced by a second coil, which acts in conjunction with the moving element, the operation being based on the dynamometer principle. The Weston Company also manufacture instruments for alternating current service and instruments designated "Eclipse" models for direct current service, both being of the soft iron type. Notable characteristics of Weston instruments are their accuracy and economy of current consumption, combined with excellent mechanical and electrical workmanship and design.  
—WESTON ELECTRICAL INSTRUMENT CO., WAVERLY PARK, NEWARK, N. J.

**INSTRUMENTS.** Various instruments for laboratory and commercial uses.

- J. & H. BERGE, NEW YORK CITY.
- BROWN INSTRUMENT CO., PHILADELPHIA, PA.
- EIMER & AMEND CO., NEW YORK.
- CHARLES ENGELHARD, NEW YORK CITY.
- INTERNATIONAL INSTRUMENT CO., CAMBRIDGE, MASS.
- LEEDS AND NORTHRUP CO., PHILADELPHIA, PA.
- E. H. SARGENT & CO., CHICAGO, ILL.
- SCIENTIFIC MATERIALS CO., PITTSBURGH, PA.
- TAYLOR INSTRUMENT COMPANIES, ROCHESTER, N. Y.
- ARTHUR H. THOMAS CO., PHILADELPHIA, PA.
- C. B. THWING, PHILADELPHIA, PA.
- WILSON-MABULEN CO., NEW YORK CITY.

**INTERFEROMETERS** and accessories. Catalog 1.  
—WM. GAERTNER & CO., CHICAGO, ILL.

**JAR MILL** Laboratory. See Crushing and Grinding.

**KELVIN BRIDGE.** See Bridge.

**KOHLRAUSH BRIDGE.** See Bridge.

**LABORATORY SUPPLIES.** Chemicals and chemical apparatus. Standard c.p. chemicals, imported direct. Complete laboratory equipments and supplies.

—BAUSCH & LOMB OPTICAL CO., ROCHESTER, N. Y.

**LABORATORY SUPPLIES.** Everything for the chemist and assayer. Chemical apparatus and c.p. chemicals and standard reagents, furnaces, muffles, crucibles, etc.

—J. & H. BERGE, NEW YORK CITY.

**LABORATORY SUPPLIES.** High-grade chemical and assay apparatus, chemicals, etc., etc. Manufacturers and direct importers. An enormous and most complete stock of anything that is needed in the laboratory. Any article listed in our 440 pages catalog on Chemical Apparatus is kept in stock. Established 1851.

—EIMER & AMEND, NEW YORK CITY.

**LABORATORY SUPPLIES.** Apparatus, Instruments, and Appliances. We manufacture a complete line of universal laboratory supports and appliances; the parts of the system of our supports are interchangeable, and are capable of being used in many different ways, the various combinations often serving the purpose of expensive pieces of apparatus; see our illustrated catalog S-T. We specialize on high-grade physical apparatus covering almost every requirement and have special facilities and a large well-equipped shop for the construction of apparatus for research work. Catalog A on astronomical instruments. Catalog D on physical demonstration apparatus. Catalog E on electrical apparatus. Catalog H on high-school laboratory apparatus. Catalog I on interferometers and accessories. Catalog M-L on instruments of precision, laboratory apparatus.

—WM. GAERTNER & CO., CHICAGO, ILL.

**LABORATORY SUPPLIES.** A full line of everything needed for the laboratory. A specialty the improvement on older forms of apparatus.

—THE EMIL GREINER CO., NEW YORK.

**LABORATORY SUPPLIES.** Laboratory and assay apparatus, chemicals and reagents. Mill chemicals. Merck's chemicals, Schuchardt's chemicals, J. T. Baker Chemical Co's. analyzed chemicals. Write for our catalogues covering over 600 pages.

—HENRY HEIL CHEMICAL CO., ST. LOUIS, MO.

**LABORATORY SUPPLIES.** Chemicals and chemical apparatus. All kinds of apparatus, made for use in chemical laboratories, glass, wood, hardware, etc.

—QUEEN & CO., INC., PHILADELPHIA, PA.

**LABORATORY SUPPLIES.** Chemicals and laboratory and assayers' supplies. Importers and dealers in chemical glass and

porcelain ware and chemicals, manufacturers of chemists' hardware (clamps, supports, burners, etc.), and dealers in all kinds of chemicals and apparatus for analytical chemists. Established 1852.

—E. H. SARGENT & Co., CHICAGO, ILL.

**LABORATORY SUPPLIES.** This we make our sole business and carry in stock all the apparatus and chemicals necessary for the entire equipment of any chemical or bacteriological laboratory. The largest and most complete catalog ever published (over 540 pages and describing over 3,000 different apparatus) will be furnished on request. A complete stock of high-purity chemicals.

—SCIENTIFIC MATERIALS CO., PITTSBURGH, PA.

**LABORATORY SUPPLIES.** Chemicals. A full assortment of chemicals for analytic work from most reliable makers in Europe and America. All of Baker's analyzed chemicals, factory packing in special packages for our trade. A complete stock of apparatus equipment for both chemical and biological laboratories. 440-page illustrated catalog on request.

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#### **LABORATORY SUPPLIES.**

—BUFFALO DENTAL MFG. CO., BUFFALO, N. Y.

—HOSKINS MANUFACTURING COMPANY, DETROIT, MICH.

—INTERNATIONAL INSTRUMENT CO., CAMBRIDGE, MASS.

—LEEDS AND NORTHRUP CO., PHILADELPHIA, PA.

—SCHUTTE & KOERTING, PHILADELPHIA, PA.

—F. J. STOKES MACHINE CO., PHILADELPHIA, PA.

—WILSON-MAEULEN CO., NEW YORK.

**LAMP AND SCALE** for galvanometer reading with transparent celluloid scale engine divided. Catalog M-L.

—WM. GAERTNER & Co., CHICAGO, ILL.

**LAMP AND SCALE.** For use with reflecting galvanometers. The image of a brilliantly illuminated lens is reflected by the mirror of the galvanometer on to an accurately divided scale. In the Taylor-Cambridge lamp and scale, the scale is transparent and can therefore be read from either side; the lamp contains a Nernst filament and gives an image bright enough for reading in ordinary daylight. Both lamp and scale are adjustable and are mounted upon a stand which may be portable or fixed.

—TAYLOR INSTRUMENT COMPANIES, ROCHESTER, N. Y.

**LAMPS, QUARTZ.** Heraeus patented fused-quartz-glass lamps, with mercury, cadmium or zinc, for commercial, scientific, and medicinal purposes. Write for pamphlet.

—CHARLES ENGELHARD, NEW YORK.

**LEAD BURNERS.** See Blowpipes; also Part I of Dictionary.

**MAGNESIA, ELECTRO.** Supplied in powder or granular form or as articles molded from it, such as tubes, crucibles, pyrometers, basins, pipes, muffles, plates and triangles. Highly infusible. Stands a temperature of 1900° C. Especially valuable for heating and melting alkaline substances.

—NATIONAL CARBON CO., CLEVELAND, OHIO.

**MEASURING MACHINES** (microscopes). For all possible purposes of the highest degree of precision. Catalog M-L.

—WM. GAERTNER & CO., CHICAGO, ILL.

**METEOROLOGICAL INSTRUMENTS.** To meet all the requirements of the mining engineer. Aneroid barometers of extreme sensitiveness for quickly ascertaining slight variations in grades, capable of registering from 2000 below sea level to 4000 ft. above. Anemometers for ascertaining the velocity of air currents in mines. The volume of air passing a given point per minute is easily found by multiplying the velocity by the area of the passage. Temperature indicating and registering devices.

—QUEEN & CO., INC., PHILADELPHIA, PA.

**METERS, QUEEN.** These instruments are of the D'Arsonval permanent-magnet type moving-coil system, the action being perfectly dead-beat and the scale divisions accurately placed. Suitable only for use on direct-current circuits, and made in all ranges from a total of 100 millivolts up to the highest possible current and voltage readings that ever might be desired on this type of indicator. Several features render the meter especially valuable in regard to appearance, durability and permanency. Accuracy in the portable type  $\frac{1}{5}$  of 1%; switch type  $\frac{1}{2}$  of 1%. We also make portable and switchboard-type instruments for alternating-current circuits, dynamometers, galvanometers and other current measuring instruments.

—QUEEN & CO., INC., PHILADELPHIA, PA.

**MICRO-MANOMETER.** An instrument for measuring extremely small differences of fluid pressure; used in the estimation of flow of gases in pipes. The Taylor-Cambridge micromanometer is made according to an original design by R. Trelfall. Measures small differences of fluid pressure up to a maximum of 100 millimeters water pressure. Particularly useful with Pitot tube and side gauge for estimating the velocity of flow of gases in pipes. The measurement is made by a micrometer screw with an accurately divided head. The position of contact between the point of the micrometer screw and the liquid in the gauge is seen by the springing up of the liquid round the point due to surface tension. The readings can be made down to 100th millimeter.

—TAYLOR INSTRUMENT COMPANIES, ROCHESTER, N. Y.

**MICROSCOPES.** For many years we have bent our efforts to designing and making new types of microscopes of increasing effi-

ciency, in a wide variety and at reasonable prices. Two factors of great significance have recently contributed to the still greater perfection of our instruments. Firstly, we have developed the scientific computation and construction of microscope objectives to a high state of efficiency; our present optical systems for the microscope were designed and executed under the direction of Dr. Hermann Kellner and embody novel features hitherto unattained. Secondly, we refer to our recent alliance with the Carl Zeiss Optical Works of Jena. All our microscopes are made from raw materials within our own manufactory and we control every operation from the making of castings to the shipping of our products. Our microtomes and projection apparatus have recently been remodeled and improved. For descriptions of our microscopes see our catalog on Microscopes and Accessories. We also make the Bausch & Lomb Chamot chemical microscope, designed for chemical investigations of all kinds after specifications of Professor Chamot.

—BAUSCH & LOMB OPTICAL CO., ROCHESTER, N. Y.

**MICROSCOPES** of the best makers, including those of Carl Zeiss and the Spencer Lens Co.

—EIMER & AMEND, NEW YORK CITY.

**MICROSCOPES.** Complete line of some of the best European makes. Carried in stock.

—WM. GAERTNER & CO., CHICAGO, ILL.

**MICROSCOPES.** The eight grades of Queen compound microscopes cover the entire field of microscopy. Complete outfits for petrographical, crystallographical, and metallurgical work.

—QUEEN & CO., INC., PHILADELPHIA, PA.

**MICROSCOPES.** The Sauveur metallurgical microscope. Complete microscopic outfits, including all needed accessories, specially constructed for the examination of metals and alloys.

—SAUVEUR AND BOYLSTON, CAMBRIDGE, MASS.

**MICROSCOPES.** A full line of various makes.

—E. H. SARGENT & CO., CHICAGO, ILL.

—SCIENTIFIC MATERIALS CO., PITTSBURGH, PA.

**MICROSCOPES.** Complete line of Bausch & Lomb microscopes carried in stock for immediate delivery at factory prices. Also microscopes and optical measuring instruments of Carl Zeiss.

—ARTHUR H. THOMAS CO., PHILADELPHIA, PA.

**MILK APPARATUS.**

—BAUSCH & LOMB OPTICAL CO., ROCHESTER, N. Y.

**MILLI-AMMETERS. WESTON STANDARD.** See Instruments, Westons Standard.

—WESTON ELECTRICAL INSTRUMENT CO., WAVERLY PARK, NEWARK, N. J.

**MILLIVOLTMETERS, WESTON STANDARD.** See Instruments, Weston Standard.

—WESTON ELECTRICAL INSTRUMENT CO., WAVERLY PARK, NEWARK, N. J.

**MUFFLE FURNACES.** See Furnaces, also Laboratory Supplies; also Part I of this Dictionary under Furnaces Muffle.

**NEPHELOMETER, RICHARDS.**

—INTERNATIONAL INSTRUMENT CO., CAMBRIDGE, MASS.

**OHMMETERS, WESTON.** See Instruments, Weston Standard.

—WESTON ELECTRICAL INSTRUMENT CO., WAVERLY PARK, NEWARK, N. J.

**OIL TESTING Apparatus.**

—BAUSCH & LOMB OPTICAL CO., ROCHESTER, N. Y.

**OIL TESTING.** Apparatus. All the necessary apparatus for the determination of gravity, viscosity, flash point and chemical composition of oils.

—EIMER & AMEND, NEW YORK CITY.

—E. H. SARGENT & CO., CHICAGO, ILL.

—SCIENTIFIC MATERIALS CO., PITTSBURGH, PA.

—ARTHUR H. THOMAS CO., PHILADELPHIA, PA.

**OIL TESTING APPARATUS.** A new form of flash point tester and viscosimeter.

—THE EMIL GREINER CO., NEW YORK.

**OPTICAL PARTS.** Lens, prisms, plane parallel plates, and mirrors of any description. Preparations of quartz and iceland spar, absorption cells, etc. Special catalog issued. .

—WM. GAERTNER & CO., CHICAGO, ILL.

**OVENS, ELECTRIC.** The term applies to hot air chambers for drying or for baking (or for constant-temperature chemical reactions) at moderate temperatures say 50° C. to 300° C. See Furnaces, Electric.

**OXYGEN.** Production of. See Part I of Dictionary.

**OZONE APPARATUS.** See Ozonizer in Part I of this Dictionary.

**PHOTOMICROGRAPHIC APPARATUS.** For makers see Microscopes.

**PLATINUM WARE** of all kinds. Platinum crucibles, dishes electrodes; triangles, cones, gauze, tongs, sheet and wire for all purposes.

—AMERICAN PLATINUM WORKS, NEWARK, N. J.

**PLATINUM** for all purposes. Hammered to shape, tested and strictly guaranteed. An American product, manufactured by skilled workmen. Special apparatus of any size or shape made from drawings. Scrap purchased.

—BAKER & CO., NEWARK, N. J.

**PLATINUM** ware. Made of pure platinum, hammered into the various forms. Sold according to weight.

—BAUSCH & LOMB OPTICAL CO., ROCHESTER, N. Y.

**PLATINUM.** Crucibles, dishes, electrodes either stationary or rotating, either in stock forms, as illustrated in our catalogue, or made in accordance with drawings or models that may be submitted. C. P. Platinum and platinum-rhodium for thermo-couples; also platinum-iridium alloy in any desired form for the analyst, electro-chemist, or metallurgist.

—J. BISHOP & CO. PLATINUM WORKS, MALVERN, PA.

**PLATINUM** ware. Crucibles, dishes, triangles, wire, foil, etc. Chemically pure platinum, containing no iridium or other metals. Hammered ware of Demontis & Co's. make (imported.) Largest stock of ready-made ware; vessels of special size or shape made to order at short notice. Wire, foil, or vessels of platinum-iridium alloy to order.

—EIMER & AMEND, NEW YORK.

**PLATINUM** apparatus, hammered.

—CHAS. ENGELHAAD, NEW YORK.

**PLATINUM.** Hammered platinum ware and apparatus of all kinds for laboratory use.

—HENRY HEIL CHEMICAL CO., ST. LOUIS, MO.

**PLATINUM.** Pure or alloyed, in sheet or wire, any size, shape or degree of hardness, for all purposes. Platinum-ware dishes, crucibles, etc., for any and all purposes required by chemists, druggists, chemical supply houses, colleges, physicists, students, experimenters and manufacturers. All of our platinum-ware is guaranteed imported hammered and free from all flaws and blisters. Anything containing gold, silver or platinum, either refined or purchased.

—ROESSLER & HASSLACHER CHEMICAL CO., NEW YORK.

**PLATINUM** apparatus and appliances of all kinds for laboratories.

—E. H. SARGENT & CO., CHICAGO, ILL.

**PLATINUM** ware, crucibles, dishes, sheets, wire, foil, and laboratory apparatus of finest pure hammered platinum.

—SCIENTIFIC MATERIALS COMPANY, PITTSBURGH, PA.

**PLATINUM** apparatus, hammered, for use in laboratories, at current prices.

—ARTHUR H. THOMAS CO., PHILADELPHIA, PA.



**POLARISCOPES** standard makes for commercial and research laboratories.

—BAUSCH & LOMB OPTICAL CO., ROCHESTER, N. Y.

**POLARISCOPES.** Franz Schmidt, Haensch's make.

—HENRY HEIL CHEMICAL CO., ST. LOUIS, MO.

**POLARISCOPES.** Sole agents for Josef & Jan Fric, whose polariscopes have been adopted by the U. S. Government.

—E. H. SARGENT & CO., CHICAGO, ILL.

**POLARISCOPES.**

—SCIENTIFIC MATERIALS CO., PITTSBURG, PA.

**PORTABLE CRUSHING PLANTS.** For regular Macadam and Ballast work.

—STURTEVANT MILL CO., BOSTON, MASS.

**POTENTIOMETER.** Direct reading, and used for the precision measurement of D.C. electromotive forces from .00001 to 1.6 volts. This range is covered by a double scale, the second scale being 1/10 the value of the first scale. With accessories, it may be used up to 1500 volts, and currents up to 2000 amperes. It has a low internal resistance. The last portion of the measurement is made on an extended wire which enables fluctuating voltages to be followed with accuracy. The accuracy may be checked up at any time with facilities available in an ordinary laboratory. The resistances used in this instrument are of manganin which has a very low temperature coefficient and a negligible thermo electromotive force against copper. The coils are adjusted to equality to 1/100 per cent. The current in the potentiometer circuit is adjusted without disturbing the setting of the potentiometer.

—LEENS & NORTHRUP CO., PHILADELPHIA, PA.

**POTENTIOMETER, QUEEN.** A new design permitting voltages to be determined in steps of .00001 volt. Direct reading with cadmium cell. Simple in its manipulation. This instrument can also be used for checking laboratory standard voltmeters and ammeters.

—QUEEN & CO., PHILADELPHIA, PA.

**POTENTIOMETER, THERMO-ELECTRIC.** An instrument in which the electromotive force developed by a thermocouple is measured by "null" methods. Instead of measuring the current which flows in a circuit as the result of the electromotive force of a thermocouple, as is done in the "deflection" method, the measurement is made by balancing a known electromotive force against that of the thermocouple. The Taylor-Cambridge thermocouple potentiometer has a range up to 30 millivolts, and the scale is divided down to 10 microvolts, and is readable by estimation to 1 microvolt. Specially convenient for quick laboratory work having arrangements whereby the balance against the standard cell can

be instantly verified after each reading. Suitable galvanometers, accumulators and standard cells are supplied.

—TAYLOR INSTRUMENT COMPANIES, ROCHESTER, N. Y.

**PRESSURE GAUGE.** Mercury. The open-column mercury gauge, is a very accurate form of gauge manufactured, and its accuracy may be relied upon after years of use (which is impossible with spring gauges.) This instrument is manufactured for pressures of five to thirty pounds, and is largely used at blast furnace plants for indicating the pressure of the blast.

—BROWN INSTRUMENT CO., PHILADELPHIA, PA.

**PRESSURE GAUGES.** Vacuum gauges. Recording. For all commercial ranges of pressure and vacuum. For all pressure of steam, hot blast, blast-furnace top gas, etc. New bulletin 104.

—BRISTOL CO., WATERBURY, CONN.

**PRINCEPS ALLOYS.** Of various melting points for approximate temperature determination in kilns, especially in ceramic works.

—EIMER & AMEND, NEW YORK.

**PROJECTION APPARATUS.** See full illustrated catalog.

—BAUSCH & LOMB OPTICAL CO., ROCHESTER, N. Y.

**PROJECTION APPARATUS** for all purposes. Complete line for school, entertainment and for scientific work. Illustrated catalog.

—BAUSCH & LOMB OPTICAL CO., ROCHESTER, N. Y.

**PULVERIZERS** for laboratory purposes, pulverizing to 200 mesh.

—EIMER & AMEND, NEW YORK CITY.

(See also Crushers.)

**PUMP, VACUUM FOR LABORATORY.** Especially intended for chemical laboratories, to create a high degree of vacuum with a small amount of steam or pressure water (as desired); termed size No. 4 (See Manufacturer's Catalog PP-4) and has a capacity (with 20 pounds water pressure) of  $\frac{1}{2}$  cu. ft. displacement per minute of air at atmospheric pressure, producing a vacuum of 29 $\frac{1}{2}$ " mercury on a 1-gallon vessel in 5 minutes; and is supplied complete including vacuum pump, vacuum gauge, connecting tee, and two cocks. Universities use it extensively in their laboratories in conducting experiments. Where larger capacities are desired regular "exhausters" are supplied as described under this heading in the first part of this Dictionary. Catalog PP-4.

—SCHUTTE & KOERTING CO., PHILADELPHIA, PA.

**PUMP.** Geryk's air pump for vacuum operates upon the hydraulic principle, by which friction is reduced to a minimum; all working joints are liquid sealed and self-adjusting; all valves are automatic, so that the air meets with no resistance whatever. There is no

clearance space, and the suction and delivery of air is absolute, however slowly the pump is worked. The liquid used is an oil of lowest vapor tension, the vacuum obtained being equal to the vapor tension of the oil in the vacuum. No air will ever leak back through the pump. The "Geryk" pump has the advantage of both mechanical and mercury pumps, and the faults of neither. It produces a vacuum comparable with that obtained by the large Sprengel or other mercury pumps and is infinitely more rapid in action. Being sealed and packed, it is not dependent upon tight-fitting mechanical pistons for the attainment of its results, and consequently the excellence of the vacuum is not diminished by wear. It is always ready for use, as the valves and pistons work in oil.

—SCIENTIFIC MATERIALS CO., PITTSBURGH, PA.

(Other dealers see Laboratory Supplies.)

**PUMPS, VACUUM.** Dr. Gaede's patented rotary, for the highest obtainable vacuum. Not affected by water vapor. Can also be used as a pressure pump.

—WM. GAERTNER & CO., CHICAGO, ILL.

**PUMPS, VACUUM.** "The Geryk," produces a vacuum equal to mercury pumps; always ready for use and has proven its merits during the last ten years. Catalog S-T.

—WM. GAERTNER & CO., CHICAGO, ILL.

**PYROMETERS. ELECTRIC RESISTANCE.** *The "bulb" or sensitive portion of the resistance thermometer contains an electric resistance which varies with its temperature. The temperature measurement is made by measuring the consequent change in resistance of the bulb. In pure metals, such as platinum, nickel, and copper, the change is approximately 4-1000 of the total resistance for each degree Centigrade. Resistance pyrometers may be used to measure any temperature from the lowest (liquid air) up to 1200° C. (about 2200° F.).*

**PYROMETER. ELECTRIC RESISTANCE.** Operated by telephone. For reading temperatures from 212° F. to 2200° F., or about 100° C. to 1200° C. in commercial work. Perfectly portable, with no adjustment to be made when placed in position. To make a measurement, the stylus or pointer is slid along a scale wire, the telephone receiver being held to the ear, and the temperature is read off on the chart immediately below the point of the stylus on the scale when the humming noise in the telephone ceases. A galvanometer may be used in place of the telephone receiver.

—EIMER & AMEND, NEW YORK.

**PYROMETERS, ELECTRIC RESISTANCE HERAEUS QUARTZ GLASS.** Measure temperatures from -200° up to +900° C.; they are absolutely exact durable, and easy to handle.

—CHARLES ENGELHARD, NEW YORK.

**PYROMETER. ELECTRIC RESISTANCE. LEEDS AND NORTHRUP.** The bulb consists of a coil of platinum or nickel wire.

Resistance change is measured with a differential galvanometer on a slide resistance. The amount of energy available for measuring purposes with these thermometers is at least 500 times that available in the best thermocouple practice, thus enabling the measuring instrument to be stouter in construction than the millivoltmeter of a thermo couple. The indicator, which is the term given to the differential galvanometer with slide resistance, is made in the following types:—Single Dial, Partial Deflection, Deflection and Recording Types. The Single Dial Type is recommended for use of the highest precision, the Partial Deflection for commercial work, and the Deflection Type for work where temperature changing rapidly are to be followed. For the supervision of temperature, the recording type, which is identical with the Single Dial Indicators, except that it is self-balancing instead of being balanced by hand, is recommended. Supplied with an accuracy which is guaranteed better than  $\frac{1}{2}\%$  of the temperature range of the instrument for all temperatures lying below 2200° Fahr. and all ranges above 8° Fahr.

—LEEDS & NORTHRUP CO., PHILADELPHIA, PA.

**PYROMETER. ELECTRIC RESISTANCE. TAYLOR-CAMBRIDGE.** In these instruments the sensitive bulb contains a coil of platinum wire suitably protected. It is made up in a variety of forms for different purposes. Suitable for use for all temperatures below 1500° F. The measuring instruments are of very high accuracy. The Whipple Patent Indicator is a portable instrument and the Callendar Patent Recorder a fixed instrument, both working on the Wheatstone-Bridge principles, and therefore capable of reading accurately very small changes in temperature.

—TAYLOR INSTRUMENT COMPANIES, ROCHESTER, N. Y.

**PYROMETERS. ELECTRIC RESISTANCE. THWING'S.** Designed especially for low temperatures. The temperature is read directly in degrees without setting. It is readily applied to the recorder. Applicable in many situations where thermocouples can not be conveniently employed.

—C. B. THWING, PHILADELPHIA, PA.

**PYROMETER. ELECTRIC RESISTANCE. WILSON-MAEULEN.** Indicator type.

—WILSON-MAEULEN CO., NEW YORK.

**PYROMETER. THERMO-ELECTRIC.** *The bulb of the pyrometer contains one junction of a thermocouple, which when heated becomes the seat of a thermo-electromotive force; this indicates the temperature of the bulb. The thermo-electric pyrometer employing platinum can be used up to 1600° C. (about 2900° F.) that is up to higher temperatures than the resistance pyrometer, and is therefore of special importance in the temperature range from 1200 to 1600° C. (about 2200° and 2900° F.). Thermocouples made of other metals have other ranges of temperature, as stated below.*

**PYROMETER, THERMO-ELECTRIC, BRISTOL.** Indicating and recording. With low resistance. Inexpensive couples of special alloys used. A special feature of the Bristol pyrometer is the compensator, which automatically makes correction for any change of temperature of the cold junction. For indicating pyrometers the commercial switchboard type of portable dead-bent indicating instrument may be employed. For recording pyrometers the record is made on a smoked chart by a method which absolutely eliminates friction between pen and chart. Widely used for measuring and recording the temperature of the blast and top gases of blast furnaces, etc., and in general for measurement of temperatures not to exceed 2000° F.

—BRISTOL CO., WATERBURY, CONN.

**PYROMETER, THERMO-ELECTRIC, BRISTOL.** For instantaneously taking the temperature of molten metals. A portable instrument. The feature is a special thermo-electric couple, the two elements of which are disconnected and left without insulation. When the tips of these elements are slightly immersed into the molten metal, an electric connection is made and the reading on the instrument will be the same as if the couple had been originally joined.

—BRISTOL CO., WATERBURY, CONN.

**PYROMETER, THERMO-ELECTRIC, BROWN.** Particularly designed for ordinary rough industrial use where an accurate instrument is desired. The thermo-couple consists of two nickel-alloy rods,  $\frac{3}{8}$ " in diameter, suitably insulated and protected by steel protecting tubes. The indicator can be either of the stationary or portable type, the stationary instrument having an extra long scale, the instrument being what is known as a large type millivolt-meter. The instrument is furnished complete with leads or wiring ready for use.

—BROWN INSTRUMENT CO., PHILADELPHIA, PA.

**PYROMETER, THERMO-ELECTRIC, BROWN RECORDING.** Makes a dotted ink line record on an ordinary white 8" recording chart, the dots being formed so close together that they form practically a continuous ink line. The pointer is actuated in this instrument the same as in an indicating instrument, and the 8" chart is brought forward and makes a contact every minute with the ink pen. The whole clock mechanism is of powerful construction, and is designed for ordinary shop use.

—BROWN INSTRUMENT CO., PHILADELPHIA, PA.

**PYROMETER. THERMO-ELECTRIC.** For 200° to 2900° F., consisting of a platinum, platinum-rhodium couple, and a D'Arsonval galvanometer. The thermo-electric wire couples can be replaced at any time, as they are interchangeable. Sold as indicating as well as recording instrument.

—EIMEE & AMEND, NEW YORK.

**PYROMETER. THERMO-ELECTRIC. HERAEUS-LE CHATELIER.** Measures temperatures between zero and 1600° C. or up to 2920° F. Recognized as standard instrument. Widest distribution. The Heraeus thermo-couples are interchangeable after years. Write for our red and blue books.

—CHARLES ENGELHARD, NEW YORK.

**PYROMETER, THERMO-ELECTRIC, HOSKINS.** For practical shop and laboratory use; especially applicable to experimental work. Its advantages lie in the physical properties of the patented element used for its thermo-couple. This produces a straight line temperature-e.m.f. curve, which makes possible a uniform even-scale meter. The high melting point of this alloy, together with its power of resisting oxidation makes possible its use under many conditions without a protecting tube; this enables quick readings. Its range of temperature is from 150° C. (300° F.) to 1400° C. (2552° F.) The indicating meter, of the portable type; is simple, compact, robust. It can be carried from one part of the plant to another and readings taken by any careful workman. The wall-type instrument is fitted with an illuminated dial. Selective switches and other equipment for connecting several thermo-couples with one meter also manufactured.

—HOSKINS MANUFACTURING COMPANY, DETROIT, MICH.

**PYROMETER, THERMO-ELECTRIC, ADVANCE.** Large-dial indicators of standard and special ranges. Double pivot wall or portable instruments. Fire-rods of which the two elements of the couple are a rod and a tube, the insulation being around the rod and wholly inside the tube so that no short-circuiting can occur and quickest response to temperature change is obtained. Fire-rods may be bent without injury. They are made in many lengths and all interchangeable. Regular fire-rods for use to 1800° F. or 1000° C. Special thermocouples for higher heats.

—WILSON-MAEULEN CO., NEW YORK.

**PYROMETER. THERMO-ELECTRIC. ADVANCE RECORDING** Ranges to 1200° F., 1800° F., 2200° F. For use in connection with Advance fire-rods and on special alloy thermocouples. The record is made with ink on white paper, the paper travelling "straight ahead" Records continuous for 24 hours or four weeks obtained according to form of record paper used.

—WILSON-MAEULEN CO., NEW YORK.

**PYROMETER, THERMO-ELECTRIC, QUEEN.** Based on the Le Chatelier principle. Consists of a platinum-rhodium couple and a sensitive D'Arsonval galvanometer with a scale, carefully calibrated either in Fahrenheit or Centigrade degree, or millivolts if desired. The instrument has been greatly improved over former types of the company, so as to be most accurate and sensitive, be-

sides being of rugged construction throughout and capable of withstanding rough usage.

—QUEEN & Co., INC., PHILADELPHIA, PA.

**PYROMETER, THERMO-ELECTRIC, LE CHATELIER.** Consists in stationary form of a 60-inch platinum, platinum-rhodium, thermo-couple, Siemens and Halske pyrometer-galvanometer, pair of 50-inch best porcelain tubes. In portable form, the same as above except 30-inch couple and 18-inch tubes.

—SCIENTIFIC MATERIALS Co., PITTSBURGH, PA.

**PYROMETER, THERMO-ELECTRIC, SIEMENS.** The Siemens thermoelectric pyrometer can be used in connection with any suitable thermo-couple. For high temperatures between 200 and 1600° C. (about 400 and 2000° F.) the most suitable thermo-couple is platinum and platinum-rhodium. For lower temperatures up to 1000° C. (about up to 1800° F.), platinum-iridium may be used instead of platinum-rhodium. For still lower temperatures and also for temperatures down to minus 190° C. (—310° F.) constantan-silver couples are advisable on account of the higher thermo-electric force. The Siemens pyrometers are upon request furnished with a certificate of the German Reichsanstalt. Of course, the Bureau of Standards in Washington will also test and certify the Siemens pyrometers. Widely used for blast furnaces, foundries, hardening furnaces, boilers porcelain furnaces, and in chemical factories.

The Siemens instrument is of highest accuracy and sensitiveness. With the pivoted direct-reading galvanometer, the necessity of levelling the instrument is avoided. Made in several types; for laboratory work the suspension-strip pyrometer is recommended; for supervision and control of temperatures the recording suspension-strip pyrometer; for supervision and control of temperatures in industrial works the recording pivoted-oil pyrometer.

A special feature of all Siemens-pyrometers, the direct-reading as well as the recording pyrometers, is their high internal resistance that amounts to several hundred ohms; even in the pivoted type. This feature enables the Siemens pyrometers to be used in connection with a special commutator so that five thermo-couples can be connected to one recording pyrometer. The Siemens & Halske Co. furnishes also a complete set of all auxiliary apparatus to be used in connection with pyrometers; especially may be mentioned a potentiometer for very exact thermo-electrical measurements according to Lindeck's method.

—SIEMENS & HALSKE Co., NEW YORK.

—CHARLES ENGELHARD, NEW YORK (Agent for the United States).

**PYROMETER, THERMO-ELECTRIC, TAYLOR-CAMBRIDGE BASE-METAL.** For use where robustness and cheapness is preferred to extreme accuracy. Standard ranges 200 to 1000° F., and 300 to 1800° F. The thermo-couple is made of thick wires of heat resisting alloys insulated by refractory compound and protected by a steel stem. It is provided with a plug head for quick attachment of cable.

The temperature measurement is made by a specially calibrated indicating millivoltmeter which may be portable, wall type or recording. The portable and wall types are independent of levelling and may be used in any position.

—TAYLOR INSTRUMENT COMPANIES, ROCHESTER, N. Y.

**PYROMETER, THERMO-ELECTRIC, TAYLOR-CAMBRIDGE STANDARD.** For high temperatures and for accurate work the thermocouple is made of platinum and platinum-rhodium, protected in a highly refractory stem. Measurement of temperature is made on a specially calibrated indicating millivoltmeter either portable, wall type, or recording. In all cases these are of high resistance and the portable and wall-type instruments do not require accurate leveling in use, nor the clamping of the coil when carrying. The scale in these instruments is over 6" long.

—TAYLOR INSTRUMENT COMPANIES, ROCHESTER, N. Y.

**PYROMETER, THERMO-ELECTRIC, THWING.** The couple consists of nickel alloys, one being in the form of a heavy tube enclosing the other, the junction being welded. This construction affords protection from injury without sacrificing quickness of response to temperature changes. The galvanometer is compensated for changes of air temperature and for error of cold ends. Furnished with *Pt/Pt-Rh* couples for temperature above 1100° C. Furnished in portable or wall form or as recorder.

—C. B. THWING, PHILADELPHIA, PA.

**PYROMETER, THERMO-ELECTRIC, THWING RECORDING.** The record is distinctly printed in ink and visible in its entirety. It is surmounted by a distinct indicating scale from which the temperature may be read directly at any time. It may be made to record simultaneously as high as four temperatures at one time, the records being distinguishable by varying frequency of the dots composing the record in one form while in another a separate galvanometer is used. This makes the comparison of two or more related temperatures very convenient. The cost of making the additional records is small.

—C. B. THWING, PHILADELPHIA, PA.

**PYROMETER, THERMO-ELECTRIC, LE CHATELIER.** Wall pattern and portable indicators with patented single-pivot movement. Indicators do not have to be set level and are not affected by heavy vibrations. Each instrument provided with automatic clamp for coil and pointer which are set free to swing when indicator is set upon either flat surfaces or wall bracket or when cover of portable instrument is opened. These indicators having high internal resistance may be calibrated for both platinum, platinum-rhodium thermocouples and "Advance" fire-rods. Platinum, platinum-rhodium couples are absolutely interchangeable and supplied in all lengths. Pyrometer tubes of refractory fire-clay, electroquartz or Royal Berlin porcelain.

—WILSON-MABULIN CO., NEW YORK.



**PYROMETER, THERMO-ELECTRIC. SPECIAL THERMO-COUPLES.** We make a specialty of thermocouples for special temperature ranges and special conditions. Thermocouples (for moderate heats) of wire as fine as No. 28 B. & S. Couples in stock for temperatures as low as 250° below 0° F. Interchangeable couples of platinum-iridium, and platinum-rhodium.  
—WILSON MAEULEN Co., NEW YORK.

**PYROMETER TUBE.** Protecting sheaths or tubes for the thermocouples used in pyrometry. In addition to fire clay, glazed porcelain, fused quartz, etc., pure Acheson graphite has proved of value in brass, aluminium, zinc and other metallurgical work. These are readily made by boring solid Acheson graphite rods. The purity, inertness, high heat conductivity and low price are favorable factors.  
—INTERNATIONAL ACHESON GRAPHITE Co., NIAGARA FALLS, N. Y.

**PYROMETER TUBES** of fused silica, all sizes.  
—THE THERMAL SYNDICATE, LTD., NEW YORK.  
—WILSON-MAEULEN Co., NEW YORK.

**PYROMETER OPTICAL.** *An instrument in which the temperature measurement is made by the comparison of the relative luminous intensity of the hot body and a standard. The adjustment is made by the operator until equality is established between the two intensities. This adjustment provides a reading which is convertible into temperature. Optical and radiation pyrometers are the only instruments permitting the measurement of temperatures above 1600° C. or about 2900° F. (the upper limit of electric pyrometers). They measure the temperature from a distance, so that the instrument is not subjected to any excessive temperature.*

**PYROMETER, OPTICAL, WANNER.** Wanner, making use of the polarizing principle discarded by Le Chatelier, has devised a photometer-pyrometer, which is a modification, suited to temperature-measurements, of König's spectrophotometer. Has been in wide use for a series of years in industrial plants, and has been improved in its latest design so as to avoid errors due to loss of light in its passage through the apparatus. Measures temperatures above 900° C. (about 1650° F.). Supplied with Reichsanstalt certificates in three ranges, one going up to 2000° C. (about 3600° F.), the second to 4000° C. the third to 7000° C. Determinations of temperature exact and rapid, no previous knowledge being required. The "new Wanner pyrometer" is made in two styles, with temperature ranges of 600 to 1000° C. (particularly for the annealing and tempering of steel), and 900 to 7000° C.; this instrument is portable, accurate and convenient.

—EIMER & AMEND, NEW YORK.  
—SCIENTIFIC MATERIALS Co., PITTSBURGH, PA.

**PYROMETER, OPTICAL, FERY ABSORPTION.** For temperatures above 1200° C. An improved form of the original optical pyrometer

of Le Chatelier. The standard of luminosity is an amyl-acetate lamp. The image of this flame when seen through the eye piece is superposed on the image of the hot body, and variation of luminous intensity in the latter is made by traversing a pair of absorbing quartz wedges between the focused image and the hot body. When equality is established the reading is made upon a scale attached to the quartz wedges. Can be used on extremely small hot bodies of irregular shape.

—TAYLOR INSTRUMENT COMPANIES, ROCHESTER, N. Y.

**PYROMETER, OPTICAL, LE CHATELIER.** For temperatures above 1000° C. The standard of luminosity is a gasoline lamp. The regulation of the intensity of the light from the standard lamp is controlled by a cat's eye diaphragm (no prisms being used).

—WILSON-MAEULEN CO., NEW YORK.

**PYROMETER, RADIATION.** *A device sensitive to temperature is subjected to the radiant heat given out by the body whose temperature is to be measured, in such a way that the measurement made is one of intensity of radiation and is within limits independent of the size of the hot body, or the distance separating it from the pyrometer. Radiation pyrometers and optical pyrometers are both based on the laws of radiation; but in the former the total heat of radiation is used as measure of temperature, in the latter only the radiation corresponding to a certain wave length.*

**PYROMETER, RADIATION, FERY.** Works at a distance from hot body. Standard ranges 1000 to 3600° F. Can be scaled as low as 600° F. and as high as desired. Radiant heat from hot body focussed by gilded concave mirror on one junction of a minute thermo-couple. The focussing arrangements make the measurement independent of distance. Can be used on hot body as small as  $\frac{1}{8}$ " diameter. Temperature is read direct on a specially calibrated millivoltmeter, portable, wall type, or recording. Millivoltmeter is of high resistance and in portable and wall types the movement is double pivoted, avoiding the necessity for accurate levelling in use.

—EIMER & AMEND, NEW YORK CITY.

—TAYLOR INSTRUMENT COMPANIES, ROCHESTER, N. Y.

—WILSON-MAEULEN CO., NEW YORK CITY.

**PYROMETER, RADIATION, FERY SPIRAL.** In a recent modification of the Fery radiation pyrometer the thermo-couple is replaced by a small spiral of two metal strips with different coefficients of expansion. When heated by the focused radiation the spiral uncurls and moves a pointer over a scale carried on the casing. The whole instrument is self-contained and is provided with a portable tripod stand. Particularly useful for rapid tests. Standard range 600 to 1300° C.

—TAYLOR INSTRUMENT COMPANIES, ROCHESTER, N. Y.

**PYROMETER, RADIATION, FOSTER "FIXED-FOCUS."** Specially designed for simplicity and rapid working. Gives practically

instantaneous readings. Portable outfit consists of receiving tube, flexible cable and robust indicator. Standard ranges 1000 to 2400° F. or 1600 to 3200° F. Can be used for portable or fixed work and is of high accuracy. Independent of distance within wide limits and requires no focusing nor leveling.

—TAYLOR INSTRUMENT COMPANIES, ROCHESTER, N. Y.

**PYROMETER, RADIATION, THWING.** A simple hand tube receives the radiations from the hot body the temperature being read directly in degrees, in five seconds after pointing at the source of heat, upon the scale of a portable galvanometer. The tube requires no focussing and the galvanometer no levelling. The entire outfit weighs but four pounds. Highly accurate where conditions are suitable. In use for temperatures as low as 200° C. but especially suitable for very high temperatures.

—C. B. THWING, PHILADELPHIA, PA.

#### **PYROMETERS. OTHERS THAN ELECTRIC, OPTICAL AND RADIATION.**

**PYROMETER, BRISTOL RECORDING.** For temperatures from 40 to 800° F., for kilns, ovens, flue gases, superheated steam, core-ovens, drying apparatus, etc. The operation depends on the pressure due to the expansion of a gas contained in a bulb which is connected with a Bristol recording pressure gauge by a small flexible copper tube 25 feet or more in length.

—BRISTOL CO., WATERBURY, CONN.

**PYROMETER. BROWN STANDARD PORTABLE.** Used largely at blast furnace plants for testing the temperature at the tuyeres. It is held to the plughole and the temperature of the hot blast, in passing through, is indicated on the dial. A desirable feature about the improved portable pyrometer is its quickness in indicating, about 25 seconds being necessary to make a test. This is important where the pressures are high.

—BROWN INSTRUMENT CO., PHILADELPHIA, PA.

**PYROMETER. BROWN HOT-BLAST.** Based on the difference in expansion of a special steel stem and non-expansion of graphite rods. The temperature is readily observed on a large 6½" dial, the pointer passing around this dial and having wide divisions reading to 10 degrees. This instrument has a porcelain dial which does not become tarnished; is practically unbreakable, the stem being all of steel and the instrument is accurate and durable when used for temperatures up to 1500 degrees Fahrenheit.

—BROWN INSTRUMENT CO., PHILADELPHIA, PA.

**PYROMETER, BROWN RECORDING.** Based on the expansion of a special alloy steel stem and the non-expansion of graphite rods. Instead of a dial with pointer as in the Brown hot-blast pyrometer the instrument is supplied with a recording mechanism with a pen

resting directly on the chart and tracing a red line on the white chart. This instrument is adaptable for recording temperatures to 1500 degrees Fahrenheit.

—BROWN INSTRUMENT CO., PHILADELPHIA, PA.

**PYROMETER. BROWN, QUICK-ACTING PLATINUM.** A portable pyrometer designed for practical use in measuring high temperatures. This instrument has no parts which can be readily broken and is suitable for placing in the hands of any ordinary workman. It is particularly used in the annealing ovens of malleable iron works, glass melting tanks, chemical works, etc. The instrument is inserted in the furnace or kiln and the pointer immediately passes around the dial, stops, the temperature is noted, and the instrument withdrawn, taking altogether about 15 seconds.

—BROWN INSTRUMENT CO., PHILADELPHIA, PA.

**PYROMETERS. GAUNTELETT.** Based on the different expansion coefficient of an iron and a copper tube. Specially adapted for higher temperatures, 1500° F. being, however, about the limit. Pyrometers in stock with dials of 1000, 1200 and 1500° F. maximum.

—EIMER & AMEND, NEW YORK.

**PYROMETER. HOBSON HOT-BLAST.** This is an English instrument which is used at blast furnace plants in certain sections of the United States. The nozzle of the instrument is held to the tuyere at the blast furnace, and the hot blast is drawn in and cooled by three parts of cold air, the actual temperature of the hot blast being read on the brass scales alongside of the thermometer designed for this purpose. It is a very handy form of instrument, and is preferred by many iron plants on account of its simplicity.

—BROWN INSTRUMENT CO., PHILADELPHIA, PA.

**PYROMETERS. PRINCEPS ALLOYS.** Strips of metals and alloys of various melting points (315 to 1775° C.) for approximate temperature determinations in ceramic works.

—EIMER & AMEND, NEW YORK.

**PYROMETERS. SEGER CONES.** Set of 36 numbered cones, ranging from 1150 to 1850° C., for use in the ceramic industry.

—EIMER & AMEND, NEW YORK.

**PYROMETER. SIEMENS WATER.** Consists of a cylindrical copper vessel containing water in which a mercury thermometer with an adjustable brass scale is inserted, and with the thermometers are furnished copper cylinders. Exactly 20 ounces of water are placed in the pyrometer, the copper ball is heated in the furnace and dropped into the water, the temperature of which rises and can be read off on the graduated scale placed alongside of the pyrometer in the actual degrees of temperature of the furnace. For measuring the temperature of annealing furnaces, etc., up to 1800° F.

—BROWN INSTRUMENT CO., PHILADELPHIA, PA.

—EIMER & AMEND, NEW YORK.

**PYROMETERS.** In most approved types, both of domestic and foreign manufacture, at manufacturers' prices.

—ARTHUR H. THOMAS CO., PHILADELPHIA, PA.

**QUARTZ, FUSED.** Fused silica is manufactured in an electric furnace from pure silica by a patented process. The apparatus made is of great value for chemical and allied industries as it entirely resists acids and heat. Laboratory apparatus is made by the same process and forms a valuable substitute for platinum in certain operations. A complete catalogue is issued, in which the apparatus for various purposes are illustrated. The ware is sold under the trade mark of "Vitreosil."

The melting point about the same as that of platinum, between 1700 and 1800° C., but is not well defined as an appreciable softening of the material occurs at 1500° C. In consequence of the very low temperature coefficient, this material can be subjected to very sudden temperature changes without any danger of breakage. The following acids are without action on this material, sulphuric, nitric, and hydrochloric or a mixture of any of these simple acids with the exception of hydrofluoric and at high temperatures phosphoric. The action of phosphoric acid on silica only commences above 400° C so that for all ordinary purposes it can be safely used with this acid. As an electrical insulator it is superior to glass, porcelain and similar materials, the resistance decreasing much more slowly with the rise in temperature. It also possesses the further advantage that the moisture does not condense on its surface and in consequence the surface leakage is much smaller than in the case of glass and materials of a ceramic nature. Its specific gravity is about 2.07, its specific inductive capacity is 3.5 to 3.6.

—THE THERMAL SYNDICATE LTD., NEW YORK.

**QUARTZ, FUSED, NON-TRANSPARENT.** Very refractory melting point above 1500° C., low coefficient of expansion, thereby unaffected by sudden and extreme changes of temperature. Not attacked by acids, except hydrofluoric. A wide range of tubes for combustion and pyrometric purposes, dishes, crucibles, triangles, muffles, etc., kept in stock.

—EIMER & AMEND, NEW YORK CITY.

**QUARTZ, FUSED, OPAQUE or electroquartz.** In the opaque state, quartz articles are made in cast, pressed, and drawn pieces with perfect glaze on both outer and inner surfaces of laboratory articles. Large basins, glazed inside. Pipes and large tubes, smooth but not glazed. Serviceable for pyrometer tubes in most cases, combustion tubes, pipes and containers for hot acids. Because of negligibly small coefficient of expansion electroquartz withstands sudden and violent temperature changes. It differs from the transparent fused quartz only in having air inclusions and so being opaque and less tough. Like the transparent fused quartz it is pure  $\text{SiO}_2$  and so should be limited to acid or neutral contents.

Laboratory crucibles and dishes which are strictly non-porous and very smooth.

—WILSON MAEULEN CO., NEW YORK CITY.

**QUARTZ, FUSED, TRANSPARENT.** Laboratory utensils, like beakers, crucibles, dishes, flask, tubes, test tubes. Have a softening point much higher than ordinary glass and stand the most sudden and violent changes of temperature without breaking. Quartz-glass resists the actions of many chemicals and the surface is not hygroscopic. Nearly any piece of laboratory glass-blown ware can be duplicated in quartz.

—EIMER & AMENO, NEW YORK CITY.

**QUARTZ, FUSED, TRANSPARENT** Hereaus. Fused quartz glass articles, of transparent fused quartz, can be raised to white heat and plunged into cold water without damage; not affected by any temperature changes. Anything that the glass blower can make, can be made of Hereaus fused quartz glass. Write for pamphlet.

—CHARLES ENGELHARD, NEW YORK.

**QUARTZ, FUSED, TRANSPARENT.** Laboratory Ware.

—SCIENTIFIC MATERIALS CO., PITTSBURGH, PA.

**QUARTZ, FUSED, TRANSPARENT.** This apparatus is manufactured by a process which has the merit of producing articles of a symmetry hitherto unattained in silica ware. The apparatus being transparent and consisting of pure silica in a thoroughly fused and homogeneous condition, fulfills purposes for which the ordinary opaque material is unsuitable. Fused quartz articles do not crack when subjected to the most violent and sudden changes of temperature; they are unattacked by the volatile acids, with the exception of hydrofluoric acid; they have a melting point approximately equal to that of platinum; they are harder than ordinary glass. Above 1000° C. permeable to hydrogen and certain other gases. Coefficient of expansion 0.00000059 per degree Centigrade (about 1/17 that of platinum). Its expansion up to 1000° C. is regular; above 1200° C. it contracts. As far as known at present, it shows no tendency to devitrification. Density 2.2.

—ARTHUR H. THOMAS CO., PHILADELPHIA, PA.

**QUARTZ, FUSED, TRANSPARENT.** The articles are hand worked and made in intricate shapes. The transparent fused quartz differs from the opaque electroquartz (see below) only in being free from air inclusions and so is transparent and tougher.

—WILSON-MAEULEN CO., NEW YORK CITY.

**QUARTZ, FUSED.** See also Condensing apparatus, Coils, Acid-proof chemical apparatus, Evaporating basins, muffles, Sulphuric acid apparatus in the first part of this Dictionary.

**QUARTZ GLASS.** A term sometimes used for fused quartz. It is not glass, but pure silica. See Quartz, Fused.

**RADIUM.** Curie's genuine salts.  
—EIMER & AMEND, NEW YORK.

**RADIUM.**  
—FUERST BROS., NEW YORK.

**REAENTS.** See Chemicals.

**REFRACTOMETERS.**  
—BAUSCH & LOMB OPTICAL CO., ROCHESTER, N. Y.

**REFRACTOMETERS.** All kinds,  
—SCIENTIFIC MATERIALS CO., PITTSBURGH, PA.

**REGULATORS.** Automatic Regulators for maintaining uniform temperatures in enclosed bodies of air or liquid.  
—TAYLOR INSTRUMENT COMPANIES, ROCHESTER, N. Y.

**RESISTANCE BOXES** Queen for use in measurement of conductivities of electrolytes. The resistances are wound with manganin and are practically free from inductance and capacity. Accuracies of 1/10, 1/25, 1/50 and 1/100 of 1% can be provided. The decade boxes are arranged with travelling plugs so as to use them for potentiometer methods.  
—QUEEN & CO., INC., PHILADELPHIA, PA

**RETORTS** for Laboratories, made of copper, porcelain, glass or iron.  
—SCIENTIFIC MATERIALS CO., PITTSBURGH, PA.

**REVOLUTION INDICATOR.** Extensively used for continually indicating the speed of engines, rotating shafts, water wheels, etc. The instrument shows at a glance by the height of a column of mercury the number of revolutions per minute made by an engine or dynamo without the necessity of counting or using a watch. This revolution indicator is particularly adaptable for slow speed engines, such as blast furnace blowing engines, and it is very extensively used for this purpose.  
—BROWN INSTRUMENT CO., PHILADELPHIA, PA.

**REVOLUTION RECORDER** Brown. Continually records on an 8" circular chart the revolutions per minute made by an engine, motor, etc., the instrument being very sensitive and recording the slightest change in speed. A clear ink line record is made on the recording chart, and the instrument can be used for either high or slow speed engines or rotating shafts. The instrument is particularly used at blast furnace plants.  
—BROWN INSTRUMENT CO., PHILADELPHIA, PA.

**RUBBER GOODS.**

—THE SALT LAKE HARDWARE CO., SALT LAKE CITY, UTAH.

**RUBBER GOODS** for Laboratories. Rubber bulbs, gloves, fingers sheets, stoppers and tubing.

—SCIENTIFIC MATERIALS CO., PITTSBURGH, PA.

**RUBBER STOPPERS AND TUBING.**

—BAUSCH & LOMB OPTICAL CO., ROCHESTER, N. Y.

**SAMPLE GRINDER.** Open-door construction; range of output 30 to 100 mesh, easily adjustable, easily cleaned.

—STURTEVANT MILL CO., BOSTON, MASS.

**SCALES** Analytical.

—THE SALT LAKE HARDWARE CO., SALT LAKE CITY, UTAH.

(See also Balances.)

**SCREEN** Laboratory. For all kinds of separations, accessible and easily cleaned. Hand sieves. A complete line of all meshes.

—STURTEVANT MILL CO., BOSTON, MASS.

**SEGAR CONES.** For measurements of temperatures, set of 36 numbered cones, ranging from 1150 to 1850° C.

—EIMER & AMEND, NEW YORK.

**SHAKING MACHINE.** J. M. Camp's. A great time and labor saver, where agitation is desired in a flask for either dissolving or precipitating, and particularly adapted for precipitating phosphorus by the molybdic acid method, or dissolving steel or pig iron for carbon combustion. Holds six of any size flasks, Florence or Erlenmeyer, from six to twenty-four ounces capacity, any one of which can be placed or removed in a fraction of a second. Requires about 1/25 horse power and can be operated by a small electric motor. (See illustrated description in *Electrochemical and Metallurgical Industry*, vol. v. p. 270.)

—SCIENTIFIC MATERIALS CO., PITTSBURGH, PA.

**SILICA, FUSED.** See Quartz, Fused.

**SLIDE RULE, CHEMISTS'.** Contains seventy-five factors constantly used in calculating analytical results. Reduces the time required for calculation of chemical analysis to a few seconds and also increases the accuracy of the results. The rule permits the reading of results to four places of figures. In addition to the calculations of percentage of given elements in a substance, the rule also serves for the performance of simple multiplication, division, determination of powers of a number, the extraction of roots, and can also be used in volumetric determinations. The factors for elements, in the different forms of combination in which they are ordinarily calculated, are indicated on the face of the rule; on the



back is a table of the atomic weights, and on the edge is a scale divided into millimeters. Write for pamphlet for description.

—SCIENTIFIC MATERIALS CO., PITTSBURGH, PA.

**SPECTROPHOTOMETER** Brace. Best and only reliable instrument for obtaining absolute accurate color measurements. Catalog M-L.

—WM. GAERTNER & Co., CHICAGO, ILL.

**SPECTROSCOPES** and spectrometers, especially designed to meet the demand of the American Market. Catalog M-L.

—WM. GAERTNER & Co., CHICAGO, ILL.

**SPECTROSCOPES.** Franz Schmidt Harnsch's make.

—HENRY HEIL CHEMICAL Co., ST. LOUIS, MO.

**SPECTROSCOPES.**

—BAUSCH & LOMB OPTICAL Co., ROCHESTER, N. Y.

—EIMER & AMEND, NEW YORK.

—E. H. SARGENT & Co., CHICAGO, ILL.

—SCIENTIFIC MATERIALS CO., PITTSBURGH, PA.

—ARTHUR H. THOMAS Co., PHILADELPHIA, PA.

**STILL.** Mercury distilling apparatus.

—WM. GAERTNER & Co., CHICAGO, ILL.

**STILLS.** For laboratory and domestic uses.

—BAUSCH & LOMB OPTICAL Co., ROCHESTER, N. Y.

—HENRY HEIL CHEMICAL Co., ST. LOUIS, MO.

**STILL** Water, Rochlitz Automatic. Works day and night without attention and gives  $\frac{1}{2}$  gallon of pure and sterilized distilled water per hour with a gas supply of 8-10 cu. ft. Descriptive circular.

—WM. GAERTNER & Co., CHICAGO, ILL.

**STILL.** Sargent's automatic water still for the continuous production of distilled water for laboratory and domestic use. Made in two sizes to produce  $\frac{1}{2}$  and 1 gallon per hour. Equipped with burners for gas or gasoline or with steam coil. We also supply automatic stills heated by steam only with a capacity of 5 gallons per hour up to any capacity desired. Electric distilling apparatus, may be operated on 110-volt alternating or direct current. Also supplied for use on 220-volt circuits. Capacity of standard apparatus is one gallon per hour. Also Scott's oil still.

—E. H. SARGENT & Co., CHICAGO, ILL.

**STILL, AUTOMATIC.** Steam heated still for large laboratories. Boiling chamber made of heavy copper, fitted with water gauge. Condensing chamber made of heavy copper with  $\frac{3}{4}$  inch heavy block tin condensing coil. The boiling chamber, condenser and steam oil are heavily coated on the inside with block tin. Approxi-

mate capacity, 4 gallons per hour. Also made for any other size desired.

—SCIENTIFIC MATERIALS CO., PITTSBURGH, PA.

**STILLS.** See also Distilling and Stills in Part I of this Dictionary.

**STONEWARE, CHEMICAL.** See Part I of Dictionary under Stoneware and Earthenware, also different apparatus made from stoneware.

**SUGAR TESTING APPARATUS.** Comprehensive stock of Polariscopes, Bus Hydrometers, and all apparatus for testing sugar.

—EIMER & AMEND, NEW YORK CITY.

**SUPPORTS.** Universal laboratory supports. A complete system of supports covering practically every requirement in chemical and physical laboratories. The parts of the system are interchangeable and are capable of being used in many different ways, the various combinations often serving the purpose of expensive pieces of apparatus. Many improvements have been made and many new and useful pieces have been added to make the system a most complete one.

—WM. GAERTNER & CO., CHICAGO, ILL.

**TELESCOPE AND SCALE** Support with celluloid scale, engine divided. Catalog M-L.

—WM. GAERTNER & CO., CHICAGO, ILL.

**TELESCOPE AND SCALE.** For the measurement of small movements at a distance a telescope is provided on an adjustable stand. Where the movement is that of the mirror in a reflecting galvanometer, a scale is also mounted and the movement of the image of this scale is measured in the eye piece of the telescope. In the Taylor-Cambridge telescope and scale, the scale is 40 cm. long divided in millimeters and figured. It can be placed horizontally or vertically. The telescope and scale are both mounted upon an adjustable stand.

—TAYLOR INSTRUMENT COMPANIES, ROCHESTER, N. Y.

**TESTING, ELECTRIC.** See Instruments; also Part III, Electrical Testing Laboratories.

**TESTING SETS,** Portable Leeds & Northrup. Conveniently portable and thoroughly reliable instruments for measuring resistances ranging from a fraction of an ohm to a few megohms, to a better degree of accuracy than that required by ordinary commercial practice and for making the Murray and Varley loop tests. They consist of a Wheatstone Bridge, a battery, and a portable galvanometer, mounted in a portable case. Besides these, they are provided with various switches and coils to admit of the location of faults, crosses and grounds on circuits whose resistance is over

10 ohms. A special type provides for the location of faults in low resistance type circuits.

—LEEDS & NORTHRUP CO., PHILADELPHIA, PA.

### **THERMOMETERS.**

—BAUSCH & LOMB OPTICAL CO., ROCHESTER, N. Y.

**THERMOMETERS.** Chemical. Of best European make, of resistance glass. The glass-blowing department of this firm is equipped to make accurate thermometers, of any range sub-divided as fine as 1/100th degree C. On special orders, thermometers are supplied tested by the U. S. Bureau of Standards. Also thermometers with certificate of German Reichsanstalt. Maximum and minimum thermometers. Thermometers for special purposes. M. Sendter's recording thermometers, etc.

—EIMER & AMEND, NEW YORK CITY.

**THERMOMETERS.** Chemical. A large stock of the best German makes, some with the certificate of the U. S. Bureau of Standards.

—WM. GAERTNER & CO., CHICAGO, ILL.

**THERMOMETERS.** Manufacturers of thermometers for all purposes and of all dimensions for tanks, acid chambers, vats, etc., also extremely accurate thermometers for calorimeters and boiling point tests. Thermometers for factory and laboratory purposes. carried in stock.

—THE EMIL GREINER CO., NEW YORK.

**THERMOMETERS** Queen, are the result of the long experience in this line of work. Queen & Co. have in many respects been the pioneer in the development of scientific thermometer making in America, for instance, 1000° chemical thermometer and the first meteorological pyrometer to 1000° made in this country were made by us. The first scientific catalogue of thermometers and meteorological instruments ever published in this country was written and issued by Queen & Co., many years ago. Queen thermometers are made for all purposes, technical, scientific, meteorological, household, etc. Data, prices and full information furnished upon request.

—QUEEN & CO., INC., PHILADELPHIA, PA.

### **THERMOMETERS, Chemical.**

—SCIENTIFIC MATERIALS CO., PITTSBURGH, PA.

—ARTHUR H. THOMAS CO., PHILADELPHIA, PA.

**THERMOMETERS.** All glass etched scale thermometers for laboratory use. All glass thermometers encased in substantial metallic case and arranged so that the temperature can be read on the outside of the apparatus, for use on air ducts etc. This corporation is the outgrowth of the thermometer business established in 1851 by George Taylor; since 1890 the company has absorbed the Hohmann & Maurer Mfg. Co. (high-grade thermometers and gauges),

the Watertown Thermometer Co. (general thermometers), the R. Hoehn Co. (commercial thermometers and hydrometers), Short & Mason, Ltd., the H. & M. Automatic Regulator Co., and the American branch of the Cambridge Scientific Instrument Co. of Cambridge, England (pyrometers and measuring instruments).

—TAYLOR INSTRUMENT COMPANIES, ROCHESTER, N. Y.

**THERMOMETERS.** Industrial type, metal-cased; designed for specific applications in all industrial purposes.

—TAYLOR INSTRUMENT COMPANIES, ROCHESTER, N. Y.

**THERMOMETERS.** Mercury-in-glass, stem-graduated, precision instruments for all chemical and laboratory work.

—TAYLOR INSTRUMENT COMPANIES, ROCHESTER, N. Y.

**THERMOMETERS.** Recording. These can be supplied with a series of scale ranges covering all industrial purposes to a maximum range of temperature of, say, 700° F. Charts can be arranged for daily or weekly records.

—TAYLOR INSTRUMENT COMPANIES, ROCHESTER, N. Y.

**THERMOMETERS.** See also Pyrometers.

**TIME RECORDER.** Bristol. Records automatically the occurrence and duration of various operations, such as the starting and stopping of machines, opening and closing of valve, etc. Used in connection with gas producers, Bessemer converters, to record charging and discharging of coke ovens, etc. Several different operations may be recorded on the same chart.

—BRISTOL CO., WATERBURY, CONN.

**TRANSITS AND LEVELS.** A complete line of transits to meet all requirements of the engineer. For mountain and mining work we make a transit, especially adapted for this work, being of a light construction, but possessing great accuracy.

—QUEEN & CO., INC., PHILADELPHIA, PA.

**TRIANGLES.** Hoskins chemist's triangle, "the equivalent of platinum, the superior of all others." Made from a special metallic alloy of very high melting point, remarkable resistance to oxidation and practically unaffected by ordinary actions of acids. Cost but one-sixteenth that of platinum.

—HOSKINS MANUFACTURING COMPANY, DETROIT, MICH.

#### **URINARY APPARATUS.**

—BAUSCH & LOMB OPTICAL CO., ROCHESTER, N. Y.

**VACUUM GAUGES.** High-quality vacuum gauges for all industrial requirements.

—TAYLOR INSTRUMENT COMPANIES, ROCHESTER, N. Y.

**VACUUM PUMPS.** See Blowers; also Pumps.

**VISCOSIMETER,** Stormer's. Simple in construction, quickly and easily cleaned, permits a large number of tests to be accurately made within a short time. Its operation depends on a paddle wheel driven by constant force. Number of revolutions measured with the aid of a stop-watch. Only 50 cc. sample required for determination of viscosity.

—BAUSCH & LOMB OPTICAL CO., ROCHESTER, N. Y.

**VISCOSIMETER,** Engler's, Reilly's, Scott's, Boverton Redwood's, Tagliabue's, Doolittle Tortion, etc.

—EIMER & AMEND, NEW YORK CITY.

**VISCOSIMETER.** Doolittle's improved torsion viscosimeter. No hole to clog and spoil results, simply a wire to twist. Instant repetition of tests can be made without cleaning the instrument. Viscosity can be measured at any temperature with ease. The viscosity of an oil can, therefore, be taken at the temperature at which it is to be used. Specific gravity does not influence the result.

—EIMER & AMEND, NEW YORK CITY.

**VISCOSIMETER** Greiner's.

—THE EMIL GREINER CO., NEW YORK.

**VISCOSIMETER.** Scott's. So constructed that the reservoir may be readily removed and cleaned. The temperature of the liquid to be tested is accurately regulated by water or liquids of higher boiling points which surround the reservoir. We also handle Tagliabue's and Engler's viscosimeters.

—E. H. SARGENT & CO., CHICAGO, ILL.

**VITREOSIL.** See Quartz, fused.

—THE THERMAL SYNDICATE, LTD., NEW YORK.

**VOLTAMMETERS, WESTON STANDARD.** See Instruments, Weston Standard.

—WESTON ELECTRICAL INSTRUMENT CO., NEWARK, N. J.

**VOLTMETERS, WESTON STANDARD.** See Instruments, Weston Standard.

—WESTON ELECTRICAL INSTRUMENT CO., WAVERLY PARK, NEWARK, N. J.

**VOLTMETER,** Scott's. For paint chemists for measuring the volume of one cubic inch of powdered material.

—E. H. SARGENT & CO., CHICAGO, ILL.

**WATER ANALYSIS.** Manufacturers of apparatus of any kind for water analysis.

—THE EMIL GREINER CO., NEW YORK.

**WATER ANALYSIS APPARATUS.**

- BAUSCH & LOMB OPTICAL CO., ROCHESTER, N. Y.
- SCIENTIFIC MATERIALS CO., PITTSBURGH, PA.

**WATER FILTER** for household and laboratory use.

- WM. GAERTNER & CO., CHICAGO, ILL.

**WEIGHTS** International Standard Metric guaranteed accurate subdivisions of the international standard kilogram adjusted on the Ainsworth precision balances in the constant temperature vault of this firm. Catalog A-4.

- WM. AINSWORTH & SONS, DENVER, COLO.

**WEIGHTS** for analytical and assay balances and for rough weighing.

- EIMER & AMEND, NEW YORK.

**WEIGHTS.** Agents for Sauter's balances and weights.

- WM. GAERTNER & CO., CHICAGO, ILL.

**WEIGHTS** for analytical and assay balances.

- HENRY HEIL CHEMICAL CO., ST. LOUIS, MO.

**WEIGHTS** for balances, assay ton weights.

- QUEEN & CO., INC., PHILADELPHIA, PA.

**WEIGHTS** and riders for balances of precision. Established 1888. Illustrated catalog E.

- VOLAND & SONS, NEW ROCHELLE, N. Y.

**WEIGHTS** for balances. See also Balances.

- SCIENTIFIC MATERIALS CO., PITTSBURGH, PA.
- ARTHUR H. THOMAS CO., PHILADELPHIA, PA.

**WHEATSTONE BRIDGE.** See Bridge.

## PART III.

### Professional Directory.

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#### **BOOTH, GARRETT & BLAIR, Philadelphia, Pa.**

Metallurgical, analytical, and engineering chemists. Firm established 1836. Analysis of special steels, ores, and minerals. Water analyses, bacteriological and sanitary. Mechanical tests of metals, stones, woods. Cement testing. While the work of the firm consists mainly in metallurgical analysis and investigation, a great variety of other work is also done. Particular attention is paid to alloy steels and also to the micrographic investigation of metals. The firm makes a specialty of general industrial investigation working out methods for obtaining the greatest efficiency of operation, and maintaining the quality of shipment by means of routine tests.

#### **R. G. BURTON AND TAFT READ, Knoxville, Tenn.**

Foresters and contracting forest engineers, one branch of whose work is of special interest to smelting companies, coke ovens, fertilizer works, and others plants which give off gases containing a sulphur or arsenic content injurious to the crops and timber lands of the surrounding country and which have as a result become involved in suits for damages. Mr. Burton and Mr. Read have had special experience in the collection of data in the field and the delivery of expert testimony in court, tending to show the relative damage to vegetation in a given locality done by fire, insects, fungi and other causes as compared with the damage done by deleterious gases.

#### **BYRNES, TOWNSEND & BRICKENSTEIN, Washington, D. C.**

Patent lawyers and experts in electricity, metallurgy, chemistry, and electrochemistry. This firm, while practicing patent law before the Patent Office and Courts, is qualified and largely devotes its attention to chemical, electrochemical, and metallurgical subjects. Mr. Clinton P. Townsend was for seven years assistant examiner of the class of electrochemistry in the Patent Office; he is the inventor of the Townsend electrolytic cell. Mr. John H. Brickenstein entered the Patent Office as Assistant Examiner of Metallurgy; he was thereafter in an electrical division, principal examiner of a chemical division, and for a number of years senior member of the board of examiners-in-chief. Dr. Eugene A. Byrnes was for seventeen years in the Examining Corps of the Patent Office, being for ten years principal examiner of the Division of Electrochemistry

and Metallurgy, also having charge of the Laboratory. Mr. Brickenstein and Dr. Byrnes are members of the Bar of the Supreme Court.

**GEORGE C. DAVIS, Philadelphia, Pa.**

Metallurgical chemist. Analysis of alloys, iron, coal, sand, clay, and cement. Calorific value of coal.

**ELECTRICAL TESTING LABORATORIES, New York.**

A large and very fully equipped laboratory for carrying out all kinds of electrical tests and also other tests. The laboratories were founded with the support of the largest Edison companies in this country, who recognized the necessity of such an institution, not only for their own purposes—for testing lamps—but for the electrical industries in general. A large part of the work of the Laboratories is still the testing of lamps, but the equipment of the laboratories and the personnel of the staff are such that almost any electrical test desired may be readily performed there. Besides arc and incandescent lamp tests, including gas, acetylene, etc.—the work of, the laboratories includes electrical and photometrical standardizations, resistance, conductivity, insulation and magnetic tests, calibration of instruments, etc., also tests of fuels, thermometers and materials of construction. Special investigations are undertaken. Acceptance inspections and tests of insulators, wire and cable transformers, electrical machinery, etc., are made in any part of the country. The equipment is in every respect up-to-date. Private laboratories are available for secret work, and special provision has been made for electrochemical and electrometallurgical research and development work by clients personally.

**FITZGERALD AND BENNIE LABORATORIES, Niagara Falls  
N. Y.**

The distinctive feature of these laboratories is the design, construction, and operation of electric furnaces for all purposes, and study of all problems associated therewith. Special attention is being paid to the study of electric furnaces for all grades of steel, such as the production of steel of crucible quality for tool purposes starting from cold scrap, or the production of special grades of steel for any purpose. These laboratories have had experience with nearly all the prominent types for these purposes, as well as for the production of such other electric furnace products as carbides, alloys, artificial abrasives, refractory material, etc. FitzGerald and Bennie Laboratories do not, however, represent any interests controlling special types of furnaces, hence are in position to advise and suggest as to furnaces best adapted to any particular purpose. Intimate knowledge of all types of electric steel furnaces gives this feature special value to those interested in the application of the electric furnace to steel treatment of manufacture. Special attention is devoted to the study of resistor furnaces, involving problems requiring control and accurate adjustment of temperature or atmosphere. Research work in refractories is an important branch of work carried



on. General analytical work is not undertaken; but special analytical problems connected with electric furnace work have been the subject of considerable study. The furnace laboratory equipment permits the study of problems requiring 50 to 100 kilowatts; for work on the commercial scale, up to 1000 kilowatts, special arrangements can easily be made for both power and apparatus. During the past two years a special line of furnaces have been developed suitable for intermediate temperatures, between 1000 degrees and 1500 degrees Centigrade, adapted for the melting of aluminium, brass, bronzes, and special alloys for castings, where temperature regulation and control of the atmosphere in the furnace is desired. The work has also been extended to special types of furnaces for various heating purposes, where the products of combustion existing in fuel-fired furnaces are found objectionable.

**HAMLIN & MORRISON, Philadelphia, Pa.**

Analytical chemists. Firm established 1892.

**N. L. HEINZ, La Salle, Ill.**

Contracting engineer. Plants for the manufacture of zinc and sulphuric acid, utilization of waste sulphur gases. Designer and erector of the 200-ton per day acid plant for the Ducktown Sulphur Copper and Iron Co., Isabella, Tenn., making acid from pyritic blast furnace gas.

**CARL HERING, Philadelphia, Pa.**

Consulting electrical engineer. Investigations, reports, researches, patent litigation, etc. Specialties: electric furnaces, electrolytic corrosion, electrochemistry, tests and investigations.

**WOOLSEY MCA. JOHNSON, Hartford, Conn.**

Metallurgical Engineer, Formerly electrometallurgist Orford Copper Co. and metallurgist Lanyon Zinc Co., etc. Member American Institute of Mining Engineers and American Electrochemical Society. Specialist on the application of physical chemistry to metallurgical and electrometallurgical processes. Research and electric furnace laboratory.

**E. S. LINCOLN, Brookline, Mass.**

Consulting engineer. Testing and research laboratory fully equipped for testing and research work in the electrical, chemical and electrochemical fields, for the service of those firms and individuals who require expert testing work but have not the facilities.

**DR. CHAS. F. MCKENNA, New York.**

The Laboratories of Dr. Chas. F. McKenna in New York, with their organization, equipment and records, are now a recognized centre for information on materials. His 25 years' experience in studying raw materials and the production and properties of the finished materials of technology has brought them to this high standard.

The Chemical Department is engaged in analytical work as well as synthetic work and research. It is much consulted by patentees. The technical research outfit is particularly adapted to the investigation of raw processes on a small practical scale with tanks, coils, centrifugals, grinders, furnaces, etc. Low temperatures are also provided. The Physical Department is supplied with most of the delicate physical apparatus used in the different branches of technology. The Mechanical Test Department is outfitted with heavy testing machines and the smaller machines for tests of cement, paper, textile fabrics, etc. The Bureau of Inspection is organized for the control of structural materials supplied to great works of engineering and architecture. Mill, shop, field and laboratory tests are all covered by this department. His clients are found amongst the most prominent engineers, architects, lawyers, inventors, financiers, and purchasing agents throughout the world.

**C. L. PARKER, Washington, D. C.**

Solicitor of chemical, electrochemical, and metallurgical patents. Successor to the Washington practice of Shepherd & Parker.

**SAM. P. SADTLER & SON, Philadelphia, Pa.**

Consulting and analytical chemists. Organized and equipped for experimental studies of industrial processes and products, more particularly in the line of organic material. Will advise and aid inventors in bringing chemical inventions in form for presentation to the U. S. Patent Office as well as in submitting supposed anticipations to critical examination and comparison. The firm consists of Dr. Sam. P. Sadtler, president of the American Institute of Chemical Engineers, and Sam. S. Sadtler, former Secretary of the American Electrochemical Society.

**ALFRED SANG, Paris and Pittsburgh, Pa.**

Mechanical and metallurgical engineer; designing and consulting. Specialties: the protection of metals against corrosion: including processes, continuous or automatic machines and complete plants for plating such articles as nails, bolts, screws, small hardware, tubes, telegraph material, etc., with zinc, brass, copper, tin, etc. Machines designed for special purposes. Hot galvanizing and hot tinning, also barrel and boiling processes. Zincing, brasing and coppering with zinc oxide, brass dust and copper dust. Furnace inoxidation process. Rust-proofing enamel. Special machinery for cleaning, pickling, washing, drying, polishing and scratch-brushing. Low-voltage dynamos, rheostats and measuring instruments. Member of the firm of Sang et Raffinesque, Paris, designing, manufacturing and consulting engineers. Corrosion problems: laboratory and service tests devised and carried out in all climates and under all conditions.

**JOHN E. TEEPLE, PH.D., New York.**

Consulting chemist and chemical engineer. The consulting work of Dr. Teeple relates to the design, installation, improvement and

operation of chemical plants and the investigation of chemical plants and processes. Special attention has been given to all phases of wood distillation including the recovery of turpentine, oil and other by-products from pine wood and the recovery of values from waste wood of saw-mills. Particular attention is given to the preparation and handling of materials at low costs in manufacturing plants.

**WILKINSON, FISHER & WITHERSPOON, Washington, D. C. and New York.**

Attorneys and counsellors at law, making a specialty of chemical, electrochemical, and metallurgical patent practice. The firm consists of Ernest Wilkinson, Counsellor at law, Samuel T. Fisher, formerly Asst. Commissioner of Patents, and principal examiner of one of the chemical divisions, U. S. Patent Office, and Thomas A. Witherspoon, M. S. Late principal examiner, Division of Electrochemistry and Metallurgy, U. S. Patent Office.

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